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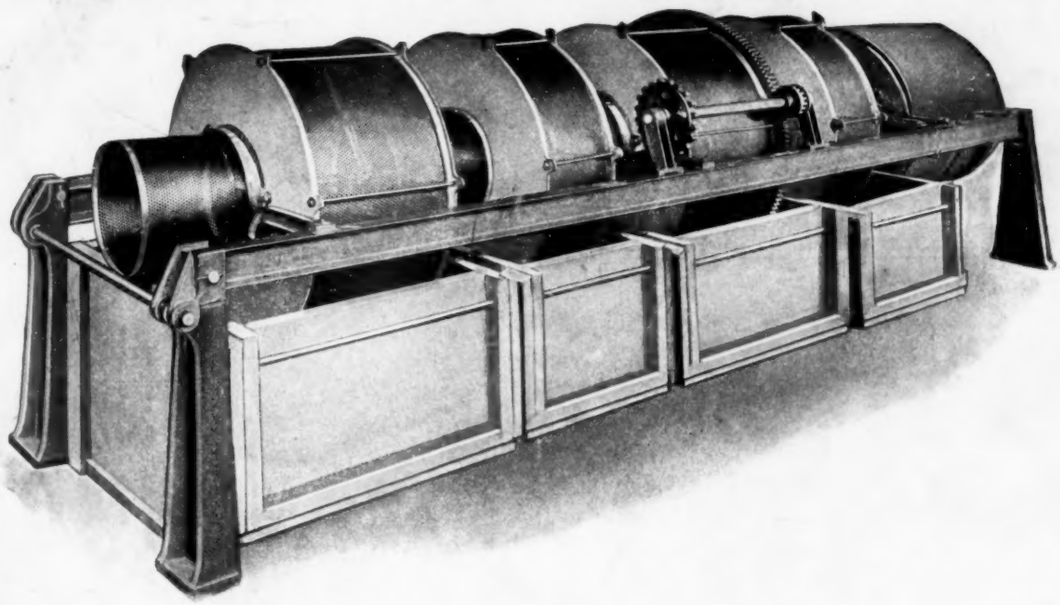

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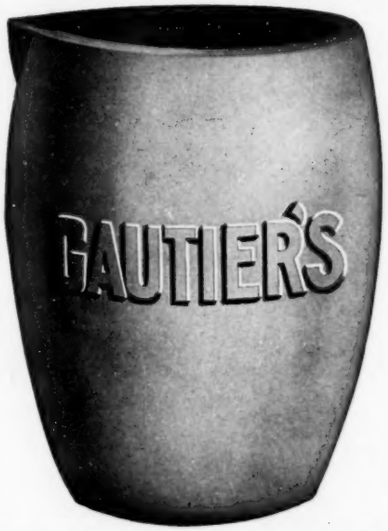

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ELECTRO-PLATERS REVIEW.

OLD SERIES Vol. 22. No. 12. | NEW YORK, DECEMBER, 1916. | NEW SERIES Vol. 14. No. 12.

EMERY GLUE

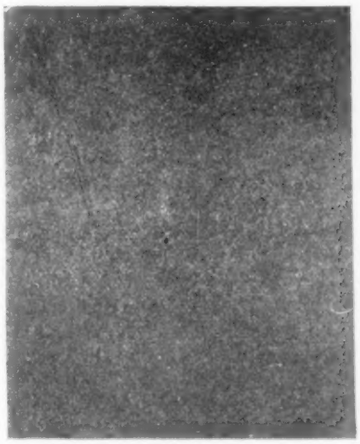
AN ARTICLE DEALING WITH THE PROPER HANDLING OF GLUE IN ITS CONNECTION WITH THE PREPARATION OF POLISHING AND BUFFING WHEELS.

WRITTEN FOR THE METAL INDUSTRY BY S. A. COCHELL, FOREMAN, MICHIGAN STOVE CO., DETROIT, MICH.

The glue reaches you in an absolutely clean condition, pure and sweet. The manufacturer has attended to his part, that is his business. Have you, as a buyer, or user, given this article a thought, as to how it is to be used, nine times out of ten? No, in your opinion, it is simply glue. When that barrel is gone there is one or two more on the way. If you are using ten, twenty or thirty pounds of glue a day, would it not be an object to you to at least make an effort to save one-quarter of that amount? Is there any other loophole in your business that you would leave open so as to lose that much money? No, there is not, and a word to you, Mr. Man, who has the handling and use of this glue. Undoubtedly you will say that you have not the time. Maybe not, but you do not do all the work that is done in your department. Is it not possible that you could teach some one man to care and take charge of the mixing of glue and impress on his mind that you want it attended to right? You know that when the glue works well you can do more and better work, and the material and time saved, under good conditions, will do more than pay you for the trouble you take. If you have at the present time every Tom, Dick and Harry attending to the glue, who knows absolutely nothing at all about it and cares less; I would advise you to change. Put one man on the job. A job that is a no-man's job, is not, as a rule, very well attended to. I have but one man who attends to all handling and mixing of the glue. The firm, who employs me, runs hundreds of tons of the most highly-polished work a year. This work has to stand the most severe inspection, both before and after being plated and conditions must be right. I use from 25 to 35 pounds of granulated hide-stock glue per day. This glue is made ground and blended by an old established firm, who makes a specialty of emery glue.

I have an 80-gallon round, cast iron kettle, heated by a 2-roll coil of one-inch pipe, with a sheet steel top, which hangs inside about four inches from the top or outer edge of the kettle. A two-inch drain pipe runs through the bottom of the kettle, the copper end being flush with the steel top, which has a four-inch hole cut in the center. This makes a perfect drain. There are also four nine-inch holes cut in the top for the glue pots to set in. On the side of these pots, there is a flange about one inch from the top to keep them from setting too low in the kettle. When these pots are not in use, they are turned upside down and the steam from the hot water in the kettle cleans them. They can be easily removed from the kettle, when it is necessary to fill them. I always use granulated glue.

The reason I use granulated glue instead of flake, is on account of the saving in labor and it can be prepared much quicker for use. The mix that I use is 13 pounds of cold water to 7 pounds of glue. The glue is poured into the water and stirred with a paddle until



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all lumps are dissolved. Then, let it stand 15 minutes before the pot is placed in the kettle. Do not let it stand longer, as the glue will get soggy in the center of the pot after it is placed in the kettle, and it will remain in a lump, which does not do it any good. It should be heated as evenly as possible to keep it uniform. If you only use one pot at a time it would be advisable to have two pots, one clean, ready for use. Never use the same pot over again without cleaning it.

Glue being animal matter, care should be taken to keep it clean. Pots should be copper and kept clean. (Iron pots will rust.) Granulated glue should be soaked in clear, cold water about 15 minutes. Flake or sheet glue will take from two to four hours, before being placed in the glue kettle. Heat to about 145 degrees. Never let glue boil. Boiling will spoil any glue. When the glue is ready to be used, if it is too thick, thin down with clean, warm water, never with cold water. If the glue should be too thin do not try to thicken it with dry glue. Thicken it with glue that has been soaked as previously stated. When it is not being used keep the pot covered, as the action of cold air on hot glue will cause a scum to form on the top. The scum should be removed before using, as it will when mixed with the glue break up into small particles and your wheel will break out wherever these little particles may be. Pour a little warm water in your glue pot and see how quickly this scum will float on top. This will show you that there is no strength to it and should be removed.

A good emery glue can be bought for from 14 to 20 cents a pound. Do not think that a cheaper glue is just as good and that you are saving money by using it, for you are not. Your emery should be kept warm, so when you roll your wheel in it it will not chill your glue. You may have a glue and it will work fine when the temperature is at 70° F., but won't do so good when it is at 90°. It may work too snappy and have a tendency to break off the wheel. When being used add about 1/10 rabbit-skin glue properly soaked, which will soften your glue and overcome this defect (Rabbit-skin glue is very soft and pliable and a small quantity should be kept in stock). If the weather is warm and the humidity is high, your mix of glue does not dry properly. Your wheels, even after they have all night to dry, are damp and gummy. The addition of a little high-grade wood glue, which is a quicker drying glue than emery glue, you will find will overcome this defect. This is the method that I have followed and have had very good results.

When opening a barrel of glue, I always make what is commonly called the Cochell copper plate test to see if it is up to standard. This test is very simple. When your glue is prepared and of the proper consistency that you are accustomed to use take a small piece of sheet copper. Buff one side of it, pour the hot glue on the buffed side, then lay flat. When the glue dries it is very easy to remove the thin sheet of glue off of the copper. After this sheet has stood the same length of time that it takes to dry your wheels, cut in strips. Bend the strips. If it shows a white milky color at the bend it is too soft. If, on the other hand, it snaps, then by following the method that I stated previously, you can overcome either of these defects. You will find by taking a little interest in this matter with proper wheels and a good glue well taken care of a man in a shop of average size can very easily save a good part of what the firm pays him in wages, besides having the good will and cooperation of the men who have to make use of the material.

I do not claim to be an expert on glue. I have simply stated in this article what I know from a practical standpoint of a man who has to produce the goods.

The three small samples of glue are from the copper-plate test:

No. 1. Is an extra special high-grade wood glue.

No. 2. Is perfect Emery glue.

No. 3. Is Rabbit-skin glue.

NICKEL SILVER.

In order to produce a serviceable nickel silver intelligently, we must in the first place make ourselves familiar with the part which each of the three principal components plays in its composition; and with a knowledge of the purpose for which the alloy before us is intended, we shall then be able to compound an alloy exactly applicable to our wants.

Nickel is the component which gives the alloy its silver-like color and resisting power against adverse chemical and atmospherical influences; on the other hand it is the most expensive of the trio. The more nickel the alloy contains the more will it resemble silver, the more expensive will it be, and the more difficult to produce, as with its increasing presence the melting point rises and the tendency to produce gases in the crucible increases likewise. The latter is equivalent with a tendency to form honeycombing. Finally the greater the percentage of nickel the harder the alloy. Generally speaking, the nickel is present in quantities of not less than 12 per cent. and not more than 26 per cent.

Copper is the most ductile component of the triunion; a high pressure of this metal is therefore desirable if we wish to produce an alloy which has to be subjected to rolling, stamping, drawing, spinning, etc., but with the increasing addition of copper the whiteness of the alloy is changed more and more into yellow, and finally even to a brownish shade. The percentage of copper generally used is within the limits of 50 and 66 per cent.

Zinc is the junior partner of the combine; its worth is least, but it perhaps bears more of the burden than its more substantial senior partners. Zinc has the tendency to lower the melting point of the alloy and it counteracts the gas-forming tendency of the nickel in the crucible. The production of the alloy is therefore made easier by the liberal addition of zinc and this incidentally reduces the cost of the alloy. The detriment of the use of a high percentage of zinc is the reduction in hardness, strength, and toughness, as well as the tendency to impair the resistance against chemical and atmospheric influences of the alloy. The presence of zinc varies in most cases between 20 and 40 per cent., and should be about three-eights of the percentage of copper; or, as some of the zinc evaporates, it is better to use the proportions of three and one-half parts of zinc to eight of copper.

We may thus summarize the foregoing as follows: Ductile nickel silver of a good color and suitable for forks and spoons, etc., should be composed of 60 copper, 25 nickel, and 20 zinc; or 50 copper, 25 nickel, and 25 zinc. Nickel silver which may have a tinge of yellow should be composed of 60 copper, 15 nickel, and 26 zinc. Nickel silver with a low melting point, which may be somewhat brittle, has 60 copper, 15 nickel, and 48 zinc.—Exchange.

An exhaustive article on nickel silver was published in "The Metal Industry" June and August, 1915.

THE INITIAL STRESS PRODUCED BY THE BURNING-IN OF MANGANESE BRONZE[1]

SOME RESULTS OF AN INVESTIGATION OF THE FAILURE OF LARGE MANGANESE CASTINGS.

A PAPER PRESENTED AT THE ANNUAL MEETING OF THE AMERICAN INSTITUTE OF METALS, SEPTEMBER 11-15, 1916, AT CLEVELAND, OHIO.

BY PAUL D. MERICA and C. P. KARR.
BUREAU OF STANDARDS.

The present investigation has been made in connection with the failure of a number of manganese valve castings in the Catskill Aqueduct, failures which have been described before this Institute by Mr. A. D. Flinn, of the New York Board of Water Supply.[2] The experience of this Board has, in brief, been that large castings of this material have after some months in service developed fissures, through which leakage took place under only a few pounds of pressure. "In most cases, indeed in nearly all, these cracks appeared to be close to or in a repair made by the method of burning in. . . ."

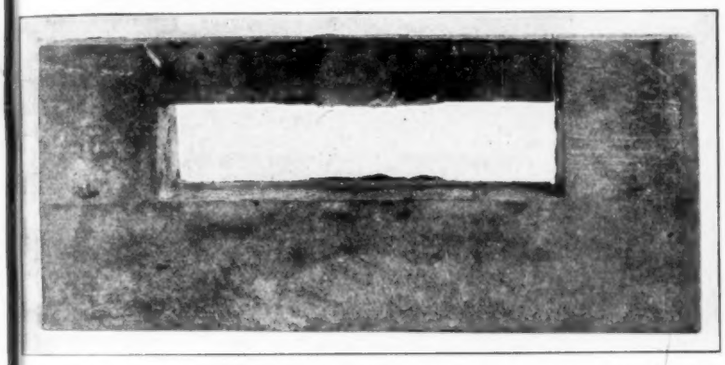


FIG. 1.—CASTING USED IN THE BURNING-IN EXPERIMENTS.

The castings, referred to above, are quite large, up to 22,000 lbs. in weight, such that neither preheating of the casting for the welding or burning-in of defective areas, nor subsequent annealing of the whole casting could be conveniently carried out. As a result of the local heating of welding and consequent unequal contraction of different constrained parts of the casting, stresses remained in the casting, particularly severe near and within the burned-in areas; these stresses were in all probability responsible for the subsequent failure at these points.

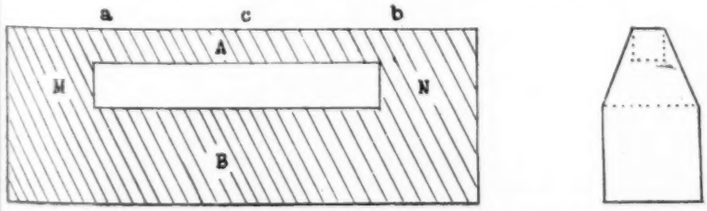


FIG. 2.—FORM OF CASTING USED IN BURNING-IN EXPERIMENTS.

The determination of the values of such stresses, in the case of castings of manganese bronze, in correlation with the physical properties and structure of this material as welded or burned-in seemed desirable.

THE MEASUREMENT AND CALCULATION OF STRESS.

For the investigation of these stresses, a form of casting, shown in the photograph, Fig. 1, and in the sketch, Fig. 2, was chosen. It is a double-bar frame, the two cross-bars, A and B, having sections of area, 1 x 1 in. and 3 x 3 in. respectively, and being connected by heavy and stiff ends M and N. The inside length from a to b (sketch) of the bars was about 9 in.

A portion of the bar A, varying from ¼ to 2 in. in length, was removed by sawing, and replaced by burning-in with the same material, care being taken to keep the bar, B, cool during the operation. The pouring gate for the burning-in was then sawed off, gauge points placed just inside of a and b, and readings taken with a strain gauge before and after sawing through A outside of the gauge point, at either a or b. Knowing the elastic modulus of the material and the contraction over the 8 in. gauge length, a direct calculation gives the value of the stress in the bar A.

Some interest attaches to the method by which the welding was accomplished. In all cases the casting was placed on its side and imbedded in green sand, a pit was then hollowed out by hand around the severed ends of A, such as to expose these ends, and the bar, from ¾ to 1 in. back, and to allow a small channel-way, from 1/16 to ⅛ in. wide around the bar at these ends. The sand was here built up slightly and a hollow iron cylinder, about 4 in. high, set over this pit, thus providing a sufficient pouring head. It was found necessary to preheat the ends to be welded, not only by means of a torch, but also by making a small reservoir in the sand directly under the burning-in pit, separated from it by sheet-iron plates, and pouring hot metal into this reservoir immediately before burning-in. No flux of any kind was used. The molten metal was first poured into this reservoir, then into the pit, completely enveloping the ends and filling the pouring head.

In order to be certain that the bar, B, of the casting was actually kept cool during the operation, this part was in several instances water-cooled while the weld was made. This was done by boring a 1 in. hole longitudinally through the center of B, attaching pipe and hose and running water through during the operation of burning-in.

The material used was that of a large scrapped manganese bronze casting, kindly furnished by the New

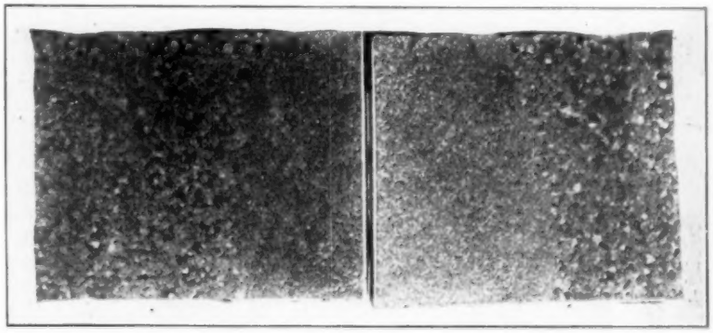


FIG. 3.—GRAIN STRUCTURE OF SECTION THROUGH BURNED-IN ZONE. ETCHED WITH AMMONIACAL COPPER CHLORIDE. ×1.

[1] A somewhat fuller account of this investigation was published as Technologic Paper No. 83 of the Bureau of Standards.
[2] A. D. Flinn, Some Experiences with Brass in Civil Engineering Works, Trans. Amer. Inst. Metals, Vol. IX, 1915.

York Board of Water Supply of the following composition:

Copper	58.5%	Lead	trace
Zinc	39.1%	Iron	1.4%
Tin	1.0%	Manganese	none

This method gave uniformly sound welds, as will be seen from some of the photographs below.

The table 1 gives the values of the tensional stresses found in the bar A of the various castings tested.

It is not difficult to make an approximate calculation of the stress in the bar A, which should result from the burning-in. Assuming that the coefficient of linear expansion is constant, that the temperature distribution along the bar A at the moment of solidification of the metal is equivalent to a temperature equal to that of the melting paint of the metal over 1.5 times the length burned-in, that the stresses are at all times less than the true elastic limit of the material, and making approximate calculation for the stiffness of the ends M and N of the frame, the tensional stress resulting in A for every inch of metal burned-in should be 36,000 lbs./sq. in.

FIG. 4.—WITHIN BURNED-IN ZONE.

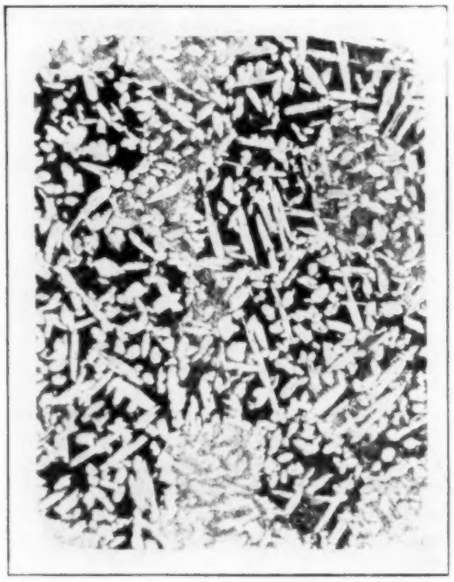


FIG. 5.—OUTSIDE OF BURNED-IN ZONE.

Figs. 4 and 5.—Microstructure of burned-in bronze casting. Etched with ammonium hydroxide. 100 diameter.

TABLE 1.

STRESSES PRODUCED BY THE BURNING-IN OF MANGANESE BRONZE.

No. of Casting.	Lenth of Bar A, Removed and Burned-in.	Stress Measured After Burning-in, lbs./sq. in.	kg./cm.[2]
232a	0.25 in.	9,600	680
232b	0.50 "	weld not sound	
232c	0.50 "	9,200	640
232d	0.50 "	8,500	600
232e[1]	0.50 "	8,500	600
232f	2.0 "	6,400	450
232g[2]	2.0 "	8,500	600

There results, actually, a stress of from 8,000 to 10,000 lbs./sq. in., irrespective of whether ¼ in. or 2 in. of the bar A were burned-in. This indicates, of course, that at some temperature, the resulting stress becomes greater than the elastic limit of the material, and the material yields thenceforth, the stress following (with probably some time lag) the elastic limit of the material, such that the stress, as measured, one or two days after burning-in, represents the true elastic limit of the material.

THE PHYSICAL PROPERTIES AND MICROSTRUCTURE OF BURNED-IN BRASS.

A tensile test was carried out on a specimen from the bar A of No. 232g, and gave the following results:

Ultimate strength	60,000 lbs./sq. in.	4,220 kg./cm.[2]
Proportional limit	13,000 "	920 "
Modulus of elasticity	15.4×10^6 "	1.1×10^6 "
Elongation in 5 in.	19.4%	
Reduction of area	26.0%	

The fracture occurred outside of the welded area, but not at the juncture of the original and the welded-in portions, and the welded-in section of the test piece was harder and less elongated than the original material. The fracture showed only a few minute flaws; it may be accepted, therefore, that the true elastic limit of the material was somewhat below the proportional limit in this case.

Consideration of the microstructure of the burned-in metal affords an explanation for its greater hardness. The figure 3 shows the grain structure within and without the welded-in area of the specimen 232c. It is seen that the central welded portion is of much finer grain than the original material, as cast, on either side, and the transition from welded to original structure is very abrupt. In Figs. 4 and 5 are shown the microstructures, inside and outside respectively, of the burned-in zone. The structures are those of normal manganese bronze, there being no difference in the two, other than that of size of grain. No evidence of overheating or of burning-out of the zinc near the juncture of the zones was noted. These results may be compared instructively with those obtained by Carnevali,[1] on similar alloys, in which the welding was done by means of the oxy-acetylene flame. In this case a burning-out of the zinc took place at the juncture of the weld. It is not surprising to find such differences in the results by the two methods, as greater opportunity for oxidation and overheating is given by the use of the oxy-acetylene process.

[1] This casting was annealed as described below before the stress determination was made.

[2] In this case the part B of the casting was cooled with running water as described above.

[1] F. Carnevali, Autogeneous Welding of Copper and Its Alloys. Journ. Inst. Metals, Vol. VIII, 1912, p. 282.

The bar A of casting 232h, with 2 in. burned-in, was brushed over continually with a solution of mercurous nitrate for about two weeks, but showed at the end of that time, no fissures or sign or failure.

A small portion, about 6 in., of the bar A of the casting 232e was wound with Nichrome wire and the bar thus locally annealed heated at a temperature of 300° C. for about one hour. The stress in the part A remained unchanged by this treatment. It may be noted that if it is wished to relieve the stresses in A by some "heat treatment" affecting it only, the part B being kept at the ordinary temperature, the part A should be cooled fifty or a hundred degrees instead of being heated.

CONCLUSIONS.

The experiments described have indicated how readily severe stresses may be introduced into a casting by the burning-in or welding of a "constrained" area or portion of it. The form of casting used in these experiments was such that no bending or distortion, tending to relieve the stresses, was possible during cooling, and this must be borne in mind in applying these results to the consideration of the effect of burning-in of more complicated shapes, where such distortion does occur.

In the spherical shell or dome-shaped valve castings of the New York Board of Water Supply, for instance, burning-in would tend to flatten the shell, and in so doing, partially relieve these stresses, and it is most difficult to calculate the stresses in such a case. The authors are inclined to believe that even in these cases local stresses of values equal to the true elastic limit must have been produced, and which would account for subsequent failure.

The conclusions to be drawn, therefore, are:

(1) That the welding-in of constrained portions of castings (forgings, wrought articles, etc., naturally, as well) of manganese bronze, produces in general local initial tensional stresses within and near the burned-in zone, of value equal to the true elastic limit of the material, unless the shape of the casting is such that extensive distortion may occur.

(2) That such castings should, therefore be either preheated carefully for welding, such that all parts of the casting cool down together from a dull red heat, or, the casting should be subsequently annealed. Experience[2] indicates that a low temperature anneal is sufficient for this purpose, e. g., from 400° to 500° C. (760° to 945° F.) for from one to two hours. Either of these precautions should eliminate these local stresses resulting otherwise from the burning-in and should produce castings free from danger of subsequent cracking.

The authors wish to express their appreciation of helpful suggestion received in conference and correspondence with Messrs. A. D. Flinn, S. W. Miller and others.

[2] See Trans. Am. Inst. Metals, 1915. The Failure of Structural Brass, by P. D. Merica and R. W. Woodward.

BRONZE STATUARY, AND ITS PRODUCTION IN ANCIENT AND MODERN TIMES

A Complete and Exhaustive Description of the Lost Wax Molding Process.

Written for the Metal Industry by George Frederick.

(Concluded from November.)

The forming of the mold for a head to be cast in sand is as follows: The pattern of the head is imbedded loosely in the lower half of the foundry-box filled with sand, and the compound mold formed on it (see sketch, Fig. 9), from which it will be seen that after the half of the compound mold has been formed, the upper half of the box is filled with sand, rammed in tightly, and covered with a board. The whole thing is now turned over, and the box, which was formerly at the bottom, and is now at the top, is removed, all the upper surface of the sand round the head is pressed down smooth and dusted with charcoal powder, and the other half of the compound mold is now formed over the back portion of the head (see Fig. 10). A box exactly fitting the other is now placed in position, and this is also rammed with sand after the surface of the compound mold has been smoothed down and dusted with charcoal. The mold is now finished, but the model is still inside; in order to remove this, one of the boxes is again removed, thus revealing the compound mold, the segments of which are now carefully removed one by one and pinned with foundry nails into their respective positions on the outer mold in the box. When this half mold has been reassembled in this way, the half of the box which still holds the mold is now again temporarily placed upside-down on some loose sand, when the same procedure is repeated. The pattern is now free, and if both boxes are placed together they form a complete mold for the head, in two pieces. A core is now prepared by either of the methods already related. Fig. 11 shows both halves of the mold with the iron round which the core of the head is to be formed, in position. Fig. 12 shows the two halves of the mold with the core in place. We will not again describe the inlet and vent channels, but simply mention that the two halves of the box must be securely joined before the metal is cast in, and it is safer to place a few heavy weights on the upper box before casting than to run any risk of failure.

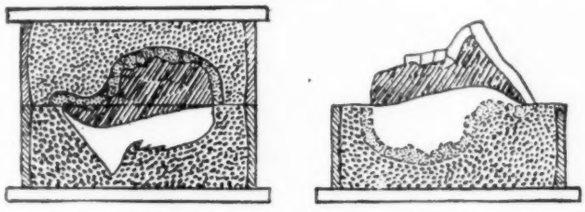


FIG. 9.—SAND CASTING (FIRST STAGE).
FIG. 10.—SAND CASTING (SECOND STAGE).

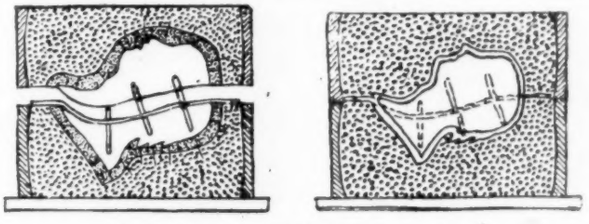


FIG. 11.—SAND CASTING (THIRD STAGE).
FIG. 12.—SAND CASTING (FOURTH STAGE).

Although practically all the bronze exhibits at the Paris Exhibition of 1844 were cast in sand, which shows that the process was at one time in almost universal use, it was doomed to be superseded again by the "lost wax"

process, as, after all, the sand casting is a more or less mechanical reproduction of the artist's work, while the bronze of the "cire perdue" process is no reproduction, but the work of art itself. The sand casting—at least a complex one—must be in nearly all cases cast in parts and mounted together afterwards, while a bronze of the wax process is but rarely built in parts.

It was in the eighties of the nineteenth century that the wax process superseded again, and came into its own, and seems likely to stay. The newest methods are somewhat simplified as compared with the older, and this simplification reduces the cost of production to approximately the same figures as those for the sand casting. We will presume again that a head of life-size is to be cast. The model—say of plaster—is painted with a shellac solution in alcohol to protect it from the moisture of the sand. This model is embedded in loose sand, either as shown in Fig. 13, face upward, or vice versa. The pattern is roughly covered with a layer of clay or foundry sand about 2 in. thick, lightly pressed down; over this a stout mantle or shell of plaster of Paris is formed (see Fig. 13). The whole thing is now turned over, the sand removed, the plaster mantle levelled at its underside, and the same process repeated as before, so that the whole of the model is now enclosed in a thick layer of clay or sand, and ensconced in a plasted casket in two halves; these two halves must have recesses or some other dovetail provision so that there can be no possible misplacement. One-half of this plaster shell is now removed, and likewise the sand or clay; the shell is replaced into its former position, but minus the clay; a hole

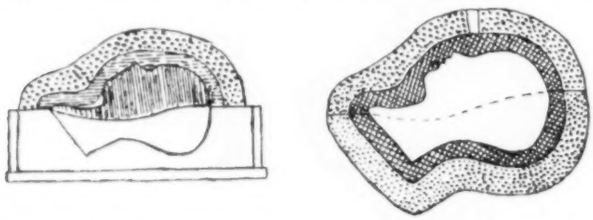


FIG. 13.—THE LATEST "CIRE PERDUE" PROCESS (FIRST STAGE). FIG. 14.—(SECOND STAGE.)

FIG. 15.—THE LATEST "CIRE PERDUE" PROCESS (THIRD STAGE).

is now bored into the shell, and the space between this and the pattern is filled with liquid gelatine (see Fig. 14). As soon as the gelatine has set, the same operation is repeated on the other half. The two halves are now again separated, and as the gelatine is elastic the model can be forced out without injuring the impression in the gelatine, though this may be momentarily distorted at the time of withdrawal. Now we proceed to paint the inner surfaces of the gelatine mold with liquid modeling wax, applied with a brush, until the whole surface of the two half molds is covered from about a sixteenth to nearly an eighth of an inch in thickness (see Fig. 15). The thick contour line of the face represents the wax. After this we pour rosin, just liquid, into the united mold, which sets quickly as it comes in contact with the cold wax surface, and begins to congeal at the outside, as it is rinsed round, to a certain thickness, when we pour the rest out again. The wax and rosin together must be of the thickness of the metal of the finished bronze (see Fig. 16); should the thickness be insufficient, more rosin is poured into the mold, rinsed round again, and the rest poured out. Core and mantle are now prepared in the manner already familiar. An iron support is formed for the core, placed into position, and the usual mixture poured into the hollow space; when this has set, the two halves of the plaster shell, with their gelatine linings, are lifted off, exposing the wax surface of the core. If the wax model requires any retouching, this is now attended to; the skeleton for the channels, as seen in Fig. 17, is added in rosin or wax, and the whole is enclosed in the usual mold, as represented in Fig. 18. After the mold is dry, the wax and rosin are melted out and the whole mold baked, when it is ready to receive the metal. The introduction of the elastic gelatine in place of the tedious work of preparing a compound mold

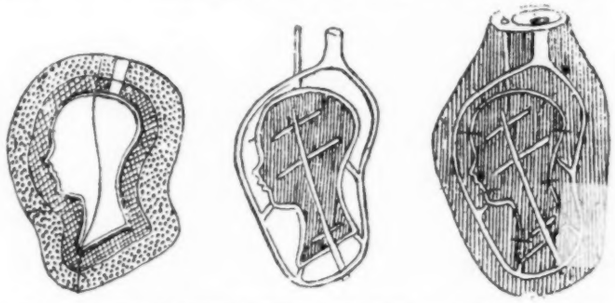


FIG. 16.—THE LATEST "CIRE PERDUE" PROCESS (FOURTH STAGE) FIG. 17.—(FIFTH STAGE.) FIG. 18.—(SIXTH STAGE.)

of sand or plaster means an enormous reduction in the cost of producing bronzes.

In olden days—say mediæval times—the sculptor was at the same time a skilled craftsman, so that the honor and glory of having produced a masterpiece was his undividedly. In the classical age this must have also been the case. It goes, of course, without saying, that the artist had pupils and assistants, because we should not expect the hand that chisels a beautiful face or a delicate hand would do the sledge-hammer work necessary to chip away seventy-five per cent. from a marble block in order to preserve the remaining twenty-five per cent. in the form of a statue. In modern days these conditions have, unfortunately, changed, and the sculptor often does not proceed in his personal work beyond a clay model, often on a small scale; but yet he claims the honor and glory for the complete work, of which he has done but a portion—a major portion it may be; yet we think that the name of the craftsman of a great work is equally entitled to be handed to posterity, as is customary in the painter's art.

(The End.)

MAGNESIA AS A LIGHTING AGENT.

In his presidential address to the American Illuminating Engineering Society, Dr. C. P. Steinmetz referred to the possibilities of magnesia as a lighting agent for general use. He said that as a result of the war the commercial manufacture of magnesia had been developed to a considerable extent, and it was quite likely that after the war, when normal conditions had returned, magnesia might be available at prices comparable with those of aluminum. It would, therefore, be of interest to study further the efficiency of the burning magnesium flame, and investigate at what price per pound magnesia would become economically competitive with the hydrocarbon flame as a light producer. If we realized such low prices of magnesia as appeared possible under normal conditions, magnesium as a combustible, in flame, lighting would come within the economic range, due to its very high efficiency.

ALLOYS TO WITHSTAND INTERNAL AIR PRESSURE

SOME VALUABLE SUGGESTIONS AS TO THE PRECAUTIONS NECESSARY FOR SUCCESSFUL PRODUCTION.

A PAPER PRESENTED AT THE ANNUAL MEETING OF THE AMERICAN INSTITUTE OF METALS, SEPTEMBER 11-15, 1916, AT CLEVELAND, OHIO.

BY S. D. SLEETH.

SUPERINTENDENT OF FOUNDRIES, WESTINGHOUSE AIR BRAKE COMPANY, PITTSBURGH, PA.

At the request of Mr. Clamer I have attempted to set forth what we might term a few observations upon the subject of "Alloys to Withstand Internal Air Pressure." Brass and bronzes have as a rule been recognized as metals adapted especially for this purpose, and this paper will, therefore, be confined to the use of such alloys. Density and strength are the two qualities that go to make up a metal suitable for the retention of air or other gases under pressure, and while strength may be secured through proper design, density is that elusive will-o'-the-wisp which we chase for a while in one direction and think we have captured, only to find that it has eluded us and we must look for it elsewhere.

This leads us then to the conclusion that there can be no hard and fast rule whereby this desirable quality of density can always be obtained, probably because of the fact that there are so many variables that enter into the process and that they cannot always be under our control. To enumerate some of these variables, we have the design of the article to be cast, the design of the pattern with reference to its position in the flask, composition of the alloy, the treatment of the metal in the furnaces, and the temperature of the metal when being poured. Each item in this list is worthy of extended discussion, but time will not permit of more than a cursory glance at each subject.

We shall begin with the design of the article to be cast. This has a very important bearing upon the ultimate success of the casting. The designer should bear in mind the desirability of having all cross sections of approximately equal thickness in order to prevent draws at heavy portions. If this is not possible, access to all large sections should be allowed for the use of chills to prevent such draws. If the cored cavities are large the cores will, themselves, act as chills. Fillets should be as small as possible in order that excessive masses of metal shall not be concentrated at one point.

In laying out patterns, the patternmaker must be governed by several things. He must know what chills are to be used so that large chilled surfaces may be placed in a vertical position in order to prevent the metal kicking off these surfaces. He must know what parts are to be clean, such as valve seats, etc., and to what parts loose sand may be allowed to flow if any be found in the mould. Such unimportant parts should be placed high in the cope and the loose sand will flow to them on top of the metal. A clean mould, however, is absolutely essential to good tight castings. An exceptionally clean casting may be obtained by gating it from another casting which will itself take all the dirt.

On the use of chills, I might state as an almost universal law: Use chills on all enlarged sections in close proximity to smaller sections and connected thereto. If the sections are exceptionally large, use a sinking head on top of the large sections. Gate your moulds with a heavy upright pouring gate as near to the pattern as possible. The gate leading from the pouring gate to the pattern should be made large at the pouring gate and then reduced sharply into the pattern. If it is large where it joins the pattern, in all probability it will show a draw, in the casting at the gate. As a rule, it is better to gate in a light part of the casting than in a heavy portion. If a sinking heavy be used it should be placed on the heavy part.

As regards the alloy to be used, the following compositions have been tried and found satisfactory for the purpose intended:

Metals	No. 1 Alloy	No. 2 Alloy	No. 3 Alloy
Copper	72.50%	82.00%	83.00%
Tin	1.75%	7.50%	11.50%
Zinc	19.25%	4.75%	4.00%
Lead	6.50%	5.75%	1.50%
Total	100.00%	100.00%	100.00%

No. 1 Alloy is used for ordinary castings, such as cocks, pistons, bushings, etc. This alloy is easily machined, but is not intended for use with very high pressures.

No. 2 and No. 3 Alloys are intended for use with high pressures and are harder to machine in proportion.

As might be expected, the treatment of the metal in the furnaces is of vital importance. If proper allowance for oxidation of zinc, etc., is not made the alloy intended will not be produced. Furthermore, the metal must be taken from the furnace as soon as its reaches the proper heat, for if allowed to soak in the furnace, it will take up gases and the castings made from it may be porous. In certain packing ring mixtures, we consider this item so important that we use an alarm clock to insure the metal being poured off at exactly the proper moment.

The temperature at which the metal should be poured into the moulds is important and no doubt many castings are lost due to carelessness in this matter. If poured too cold it is almost impossible to obtain solid castings, especially at the gate. On the other hand, if poured too hot, the castings may be porous throughout. Great care must be taken to see that no aluminum gets into the mixture, as a very small percentage of it will cause the castings to leak. Antimony and iron will do the same, but not to so great an extent. Aluminum has a very peculiar action on the metal. The castings will look solid and will not show a draw, but when put under pressure will leak all over. It is one of the most dangerous metals around the brass foundry. Antimony does not act as quickly as aluminum, but has about the same effect if used long enough in the mixture. You may start out with a small percentage and its seems to do no harm, but if used until it is mixed with all returned material, such as turnings, gates, etc., the castings will become porous.

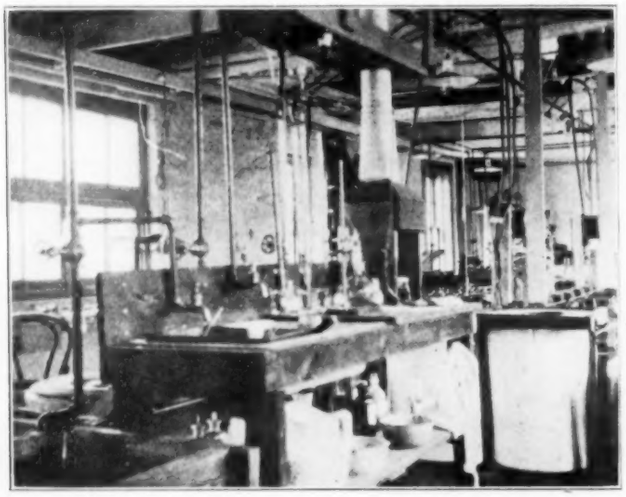
In conclusion, let me say that solid castings of a density to withstand air pressure can be obtained only by the exercise of the greatest care from the design of the article to the pouring of the metal into the mould. Even then failures will sometimes happen and final success can be obtained only through experiment and the adaptation of the various methods to the article under consideration.

THE NEW CANADIAN BRANCH OF THE ONEIDA COMMUNITY COMPANY, LIMITED

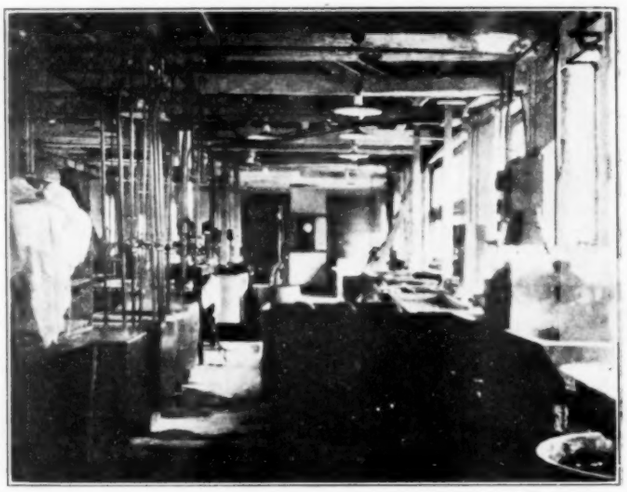
A Brief Description of a Silver Flatware Plant.

Written for The Metal Industry by George W. Grupp.

The Oneida Community Company, Limited, silverware manufacturers of Oneida, N. Y., have opened up a $25,000 Canadian branch at Niagara Falls, Ontario. This branch is the distributing point for all of their Canadian trade which has during the last few years swelled to vast proportions. Mr. A. G. Reeves and Mr. Van Auken are in charge of this branch.



THE TESTING LABORATORY.



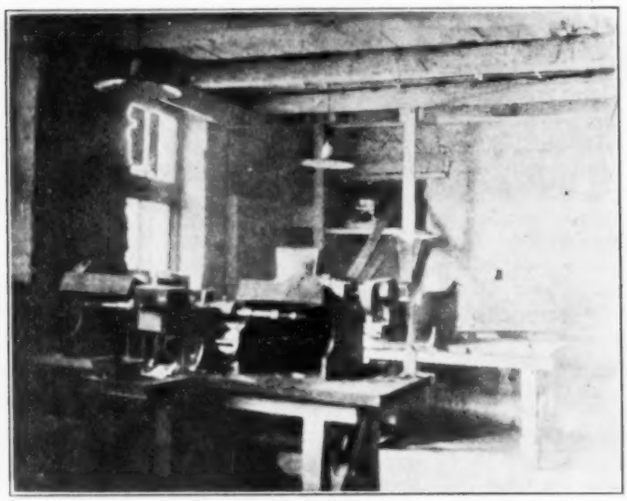
A VIEW OF THE PLATING ROOM.

This new plant, which overlooks the famous Arch Bridge, has a very large acreage of land surrounding it. The Michigan Central Railroad fronts on one end of the property. The plant itself is housed in a converted European type of stone house two stories high. It is equipped with a general plating room, a polishing room, soldering department, silver polishing room, inspection, stock and one quarter finish stock rooms and general offices.

The large acreage of land which surrounds the plant will be used at present as a recreation field for their local employees. But in the future, sometime, this property is to be occupied by a large up-to-date manufacturing plant which will house both their steel trap and silverware branches.

Throughout the plant is either lighted by artificial or natural means. All walls and ceilings have been either painted white or whitewashed to get the best possible lighting results. Windows are in plenty, both from the sides and from the skylights.

The building is heated by both hot air and steam. Ventilation is accomplished by suction fans and adjustable windows, which operate on regulating rods.



A SECTIONAL VIEW OF THE GENERAL POLISHING ROOM.

ANOTHER VIEW OF THE PLATING ROOM.

The general plating room, which is 20 x 75 feet, is equipped with two silver vats, one overlay vat, one nickel vat, testing laboratory and other necessary equipment. All vats are equipped with electrical instruments as used in plating rooms. All steam thrown off from vats, etc., is condensed in a large distill which is suspended from the ceiling in the center of the room.

The general polishing room is 23 x 27 feet and is

equipped with three large polishing machines, two drill presses, etc. The silver polishing room, which is located in another end of the building, is 9 x 18 feet and equipped with two polishing machines.

Each machine, twelve in all, in the building is equipped with an individual motor. Thus all overhead machinery has been avoided and extra dust and dirt eliminated. Each motor is operated by an oil switch.

For the convenience of all employees the most up-to-date lavatories and wash rooms have been installed. Each employee is supplied with an individual wash stand. And for their safety, all belting and dangerous machinery has been carefully safeguarded. All guards have been painted red.

In every particular this branch is modeled after their Oneida, N. Y., plant both in completeness and equipment.

THE ART OF ENGRAVING AND EMBOSSING

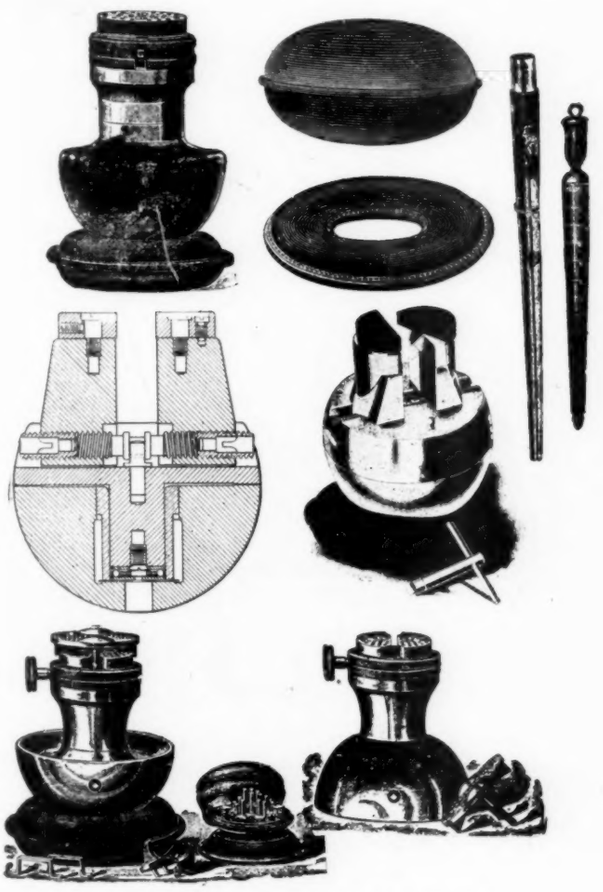
AN EXHAUSTIVE ARTICLE DEALING WITH THE PRODUCTION OF ARTISTIC EFFECTS IN METAL WORK

WRITTEN FOR THE METAL INDUSTRY BY EASY WAY.

(Continued from August.)

WORK PADS.

The work pads or sand bags generally give better results when loaded with whitening with a little plaster-of-paris added to make it firm. This filling is superior for if it should leak through the sheep skin when it is worn it will not scratch the work being finished. Some, however, use sand because of the olden custom. These bags are made from two discs of leather, varying in sizes from three to eight inches in diameter, joined together after being loaded snugly; otherwise if the material is not packed tight trouble will be experienced. These bags facilitate the handling of the work better than any other method yet developed and by mounting the different sizes prevents the engraver from stopping while at work. They are commercial and are produced in ring and solid shapes.



WORK PADS AND CHUCKS AND BLOCKS.

CHUCKS AND BLOCKS.

The engraver's block or chuck is made in several patterns. The block or chuck is used whenever the articles are not too thin or delicate to warrant them being stuck or cemented for the operation required. The base of the universal chuck as shown is composed of iron and its lower section is shaped like a ball, which admits of it being canted at any angle in a cupid socket

VARIOUS FORMS OF CLAMPS.

of wood or leather to catch the proper light on the work. The top portion of the chuck is of gun metal and rotates on a center pivot that is stationed in the iron base. The chuck jaws have a series of holes of different shapes and diameters to hold the articles in work and are manipulated by right and left hand threads which force them in or out from the center. This style has attachments for holding irregular shaped work also and with these advantages is very convenient for the artist.

The ring chucks are made in various lengths and are graduated in sizes. They are also tapered and made from steel with a suitable shaped handle. Some ring chucks, however, are made entirely of hard wood

and serve the purpose of sizing metal bands and rings of wire and also for holding them while the outer surface is being engraved.

CLAMPS.

Two hard wood blocks with a pair of guide rods and an adjusting screw running through comprise a very useful parallel clamp for holding articles, then by fastening metal plates, one half on each block, and with

EYEGLASS, REFLECTOR AND STAND.

metal studs stationed in the plates for gripping the work and, finally, by manipulating the screw, the work is held fast. Another method of holding the work is to have one stud movable in a slot and controlled by a coil spring within a hole parallel and under the top surface of a wood block. The other studs are driven into the wood to accommodate the article to be engraved. The movable stud is drawn back by hand to admit the work and then after being released the spring pulls the stud and article against the other fixed studs and down tight against the surface of the wood block. This style clamp is generally homemade and will be found very convenient as a semi-automatic fixture. Hand clamps, or which are otherwise known as hand vises, are produced of wood and also of steel. The steel ones can be obtained already made up but the wood ones are generally made by the engraver. These clamps are used for holding an article in the clamp, the clamp resting on the horn projecting from the work table as a convenience. Due to the fact that this style clamp is round, greater freedom with the work is obtained by rolling and tilting it between the thumb and fingers on the horn than if it is held in any other position.

EYE GLASS, REFLECTOR AND STAND.

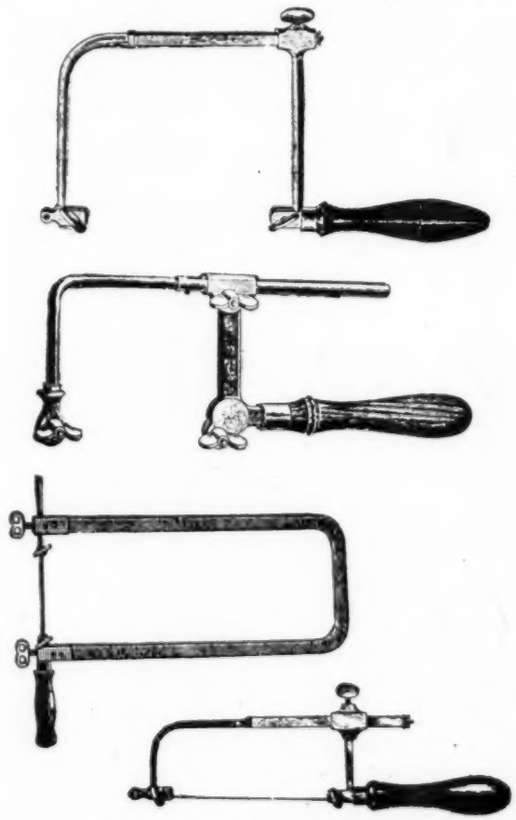
The engraver necessarily is compelled to work with a magnifying glass on account of the delicate lines to be produced when cutting scroll or floral designs, inscriptions, monograms for surface decoration, etc. The magnifying glass is a wonderful and indispensable assistant to the eyes. There are several sizes of lens mounted in many different style holders; but the loop style, single and double lens, is the one universally used and it is held before the eye by a vulcanite frame gripped by the flesh under the eye and against the bridge over the eye. Very often an adjustable eyeglass stand is used and the eye loop held in position by a projecting arm from the spindle of the stand. Also glasses ranging in sizes from five inches in diameter to smaller are used and held by a stand, when it is necessary to use both eyes on a piece of work.

FRET SAW FRAMES.

The fret saw, which is also known as a jewelers' saw, is used when piercing metals as in monogram designs. This branch of the art is practiced extensively by the Japs, who produce conventional designs that no other race can equal and they are also recognized as superiors in specimen work of skillful saw cut lines which they execute with the greatest perfection. The work which is to be finished with pierced monograms and similar designs is held on the horn on the work table with the left hand while the saw blade is drawn up and down the blade pointing downward and toward the operator.

WHIRL AND ARCHIMEDIAN DRILLS.

The pump or whirl drill and archimedian drill are used to bore holes to admit the fret saw blades and are found particularly useful in many other ways. The whirl drill spindles are generally about twelve inches long and one-quarter of an inch in diameter. They



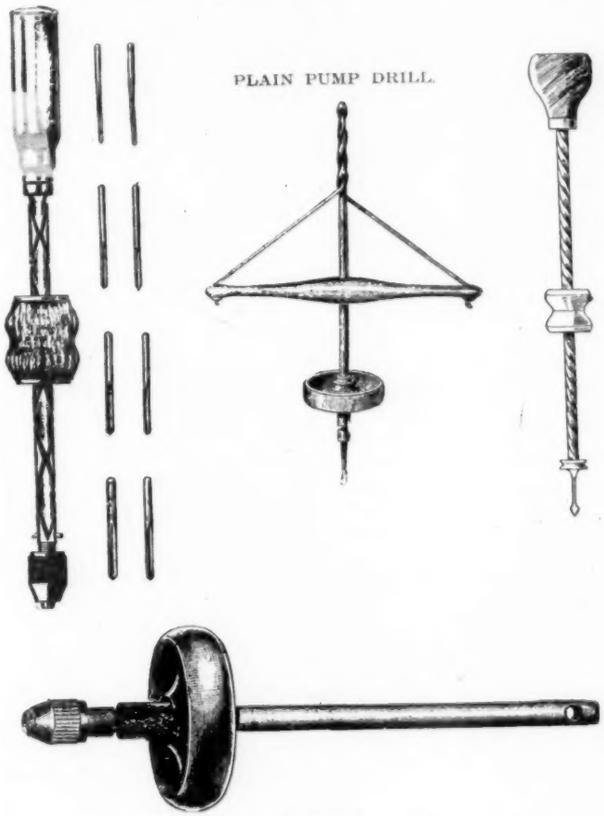
SOME FORMS OF FRET SAWS.

are equipped at the lower end with a sensitive chuck for interchanging different size drills. The upper portion of the spindle is slightly flattened and a hole drilled through to admit a tape. Between the finger piece and drill chuck there is a fly wheel which is made to fit tight to the spindle. The finger piece is of wood and is a running fit on the spindle; it is about eight inches long, tapering both ways from

the center outward and at each end two holes are drilled to admit the tape which is tied after being inserted through the hole at the upper end of the drill spindle. The whirl is now ready for use and should be held by grasping the finger piece with the thumb and fingers of the left hand and the fly wheel revolved so that the tape may twist around the spindle so far as possible, then the drill should be entered into the work and by a downward pressure on the finger piece the tape will untwist and revolve the drill. The hand is then raised at the proper moment and the tape will recoil in the opposite direction. By practicing a short time a continuous motion can be obtained. The archimedian or reciprocating automatic drill can be purchased from concerns manufacturing such apparatus.

ETCHING BOARD.

The etching board and bridge is made from hard wood which can be given a smooth finish. The sizes



PLAIN PUMP DRILL.

WHIRL AND ARCHIMEDES DRILLS.

vary to accommodate the work to be finished and the bridge is sufficiently elevated away from the board, its width being suitable for steadying the hand while at work with the etching needles. The needles are inserted in the handles about five inches thereby making a convenient hold which very much resembles a drawing pen.

HEATING TABLE.

The heating table is used for warming copper plates when etching and niello work and is an iron casting with suitable legs. The table is made so that heat can be obtained by contact with the under side of the table.

WORK BENCH AND REVOLVING TABLE.

The main feature of the work bench that should be aimed at is to have it steady and also so that it will resist all lateral strain. The bench should have a projecting horn at the front about five inches long for holding articles to be pierced with the fret saw and may also be used in numerous other ways such as for holding articles in the round clamp so that the engraver can have greater freedom, etc. The top of the table can be made from beech wood; red or white pine, however, is quite strong and suitable for such purpose. The top can be mounted on iron legs. There should be sufficient room in the center of the table to allow for a light being placed without anything to obstruct it from throwing light on the artist's work.

—PLATE WITH REST OVER IT

—HEATING TABLE

Engravers Table

ETCHING BOARD, ENGRAVERS' TABLE AND HEATING TABLE.

However, it is very essential and also desirable that the table be situated under a window. It is also necessary that the window be provided with blinds or a screen of tissue paper to ward off the direct rays of the sun as the reflection on the polished metal is very injurious to the eyes. Electric or gas light or any other artificial light should also be softened in this way. The stool or chair for the engraver should be adjustable.

(To be continued.)

LEGALISING THE CENTIGRADE SCALE IN AMERICA.

A committee of the National Academy of Sciences, consisting of Messrs. Abbot, Stratton & Marvin (the heads, respectively, of the Smithsonian Astrophysical Observatory, the Bureau of Standards, and the Weather Bureau), appointed to consider the bill before Congress discontinuing the use of the Fahrenheit temperature scale in Government publications, reported at the last annual meeting of the academy in favor of the bill, but recommended two amendments. One of the latter provides that "when in the publication of tables containing several meteorological and climatic elements the use of data in centigrade temperatures leads to manifest incongruities, the chief of the weather bureau is directed to publish related data in such units as are necessary to make the tables homogeneous and to secure international uniformity as far as practicable." The other amendment would authorize the use of the absolute centigrade scale.

THE MANUFACTURE OF ADMIRALTY GUN METAL IN ENGLAND

SOME NOTES REGARDING THE PRODUCTION OF THE BRONZE 88 COPPER 10 TIN AND 2 ZINC NOW SO MUCH IN DEMAND FOR WAR PURPOSES.

WRITTEN FOR THE METAL INDUSTRY BY H. S. PRIMROSE, M. T. M., METALLURGICAL ENGINEER TO THE CRITTALL MANUFACTURING CO., LTD., BRAINTREE.

(Continued from August.)

PREPARATION OF MOLDING SAND.

Sands as received from the pit are quite unsuited for molding purposes and require a certain amount of preparation before use. Where only small quantities are used it is possible to purchase sand which has been prepared by passing through the necessary operations of milling and mixing to render it sufficiently uniform. It is, however, more satisfactory to install plant for the conduct of this work in each individual foundry, so that the various mixtures may be made as required. The lack of homogeneity is the chief point to guard against and it is to remove pebbles and

FIG. 6.—SAND MILL MADE BY THOMAS CARLIUS SONS COMPANY, PITTSBURGH, PA.

to break down clayey nodules that the various machines are necessary. There are many useful forms of sandmill available and for small quantities the ordinary form of bottom driven edge-runner is quite satisfactory (Fig. 6). This machine is charged to a convenient depth with the dry sand and the rolling should not be continued so long as to effect much actual crushing of the sand particles, otherwise it looses its sharpness. The discharged sand can be arranged to fall directly into barrows through a bottom opening and chute. This type of machine is made in sizes varying from three feet to six feet in diameter with rolls increasing in size to correspond. For larger outputs the pan may be increased to eight feet in diameter, and in this case it is usually preferred to place the mill as low as possible and drive it with an overhead bevel gear. Either the rolls or the pan itself may be caused to rotate, but in the latter instance the milled sand must be shovelled out, unless there is a mechanical device attached to scrape it out when required. Fig. 6 illustrates such a mill which may be used either for milling sand or for mixing loam. When loam is being prepared, it is usual to crush first dry, and then, when the particles have attained the required fineness, to add sufficient water to make the whole mass into a stiff paste, binding compounds being added if necessary. To effect as thorough a mixture as possible, fixed rabbles are usually employed

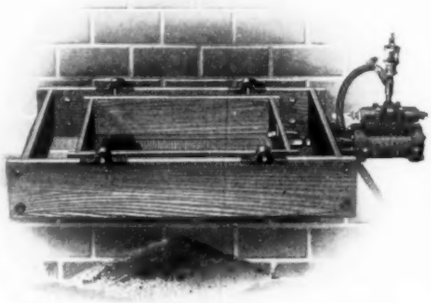


FIG. 7.—SAND SIFTING SCREEN MADE BY BATTLE CREEK SAND SIFTER COMPANY, BATTLE CREEK, MICH.

to keep the mass turned over as it spreads out behind the rolls.

RIDDLES FOR SAND.

The treatment accorded to the spent sand as knocked out of the moulding boxes depends upon for what purpose it is to be used over again. For ordinary floor sand, it is sufficient to riddle and damp it to make it suitable for re-filling the boxes, but for a facing material it must be admixed with a proportion about twice its weight of new sand to impart the necessary "body" or binding power, together with plasticity and porosity. In order to

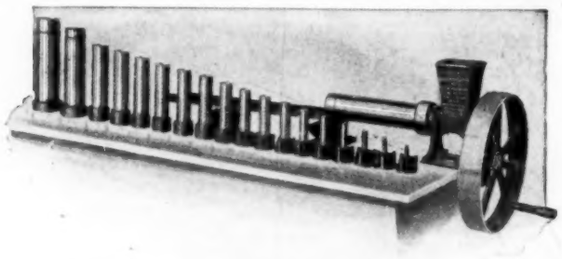


FIG. 8.—HAND POWER CORE SHAPER MADE BY WADSWORTH CORE MACHINE AND EQUIPMENT COMPANY, AKRON, OHIO.

remove all foreign material, core irons, etc., a riddle may be conveniently used, the hand operated sieve is rather slow, and the horizontal screen operated by compressed air or steam has many advantages. Fig. 7 shows a serviceable form of sand sifter, which may be arranged to be belt driven. If any trouble is experienced on account of the screens wearing out too quickly, they may be replaced by steel plates with holes. This sifted sand is commonly introduced with the requisite amount of fresh sand to the circular pan and milled along with it, but to make it perfectly suitable for working it is best to supplement this treatment with a pulverising or aerating process. Varous types of machine are used for this disintegrating and aerating of the sand, and it is advisable to

slightly moisten the sand before passing it through the machine. The best results are usually got by the use of a centrifugal machine which may be arranged either vertically or horizontally to suit the grid.

CORE MAKING.

When sand has to be prepared for making small cores the new sand is generally used without spent material, and is mixed with some binding material such as molasses, glutrin, core gum, etc., which on stoving binds the sand particles into a rod which may be handled freely without fracture, and is capable of withstanding the "wash" action of the molten metal in the mold. It must also be sufficiently porous to allow the escape of gas through the core body. Intricate and large cores require to be made up in special core boxes, or formed by winding on a core iron, suitably perforated and covered with straw rope and loam wash. It is often convenient to make small standard sizes and sections of cores by means of a core making machine. Fig. 8 shows a hand power core-shaper which may be fitted with a variety of dies which can produce lengths of round, square, hexagonal, half-round and special shaped cores, from 3/8 inch up to seven in diameter. For the larger sizes it is usually preferable to have the machine belt-driven.

FIG. 9.—PRIDMORE ROCK-OVER MACHINE MADE BY HENRY E. PRIDMORE, CHICAGO, ILL.
(Mold dropped away from pattern.)

MOLDING MACHINES.

For repetition work in which large numbers of duplicate castings are required, it is now almost universal to employ some type of molding machine. There is now a very large variety of these machines on the market, and whilst the principles involved in most of them are identical, some are more convenient for certain classes of work than others, so that care is needed in selecting the proper machine for the work in hand. The machines are chiefly of the stripping plate type, and may be fitted, in the small machines, for operating by hand, although larger machines are often worked as power squeezers and operated hydraulically or pneumatically. The main object in using the machine is to be able to draw the pattern steadily from the mold without introducing the faults entailed by hand rapping in the usual way. Many of the machines are also constructed to ram the sand in the boxes mechanically.

It is impossible within reasonable compass to describe all the various machines now employed for different purposes, but a brief outline of the salient features of the most outstanding types may be given. The Pridmore is a simple and effective type of machine which is hand rammed, and gives perfect impressions either with or without the use of a stripping plate. Whether or not this stripping plate is desirable depends upon the intricacy and depth of the pattern, shallow and round sections needing no stripping plate, but with deep patterns with a long draw it is advisable to use the plate, even although this adds to the original cost, but it saves time and failures. The stripping plate is first attached rigidly to the stationary frame and the patern plate rises into position by turning the lever over. This brings the pattern completely above the stripping plate, and to effect this the half patterns are mounted on the pattern plate, but rising above it to the thickness of the stripping plate. The molding box is next registered in the proper position by means of pins in the stationary frame, the flask is filled with sand in the usual way and rammed and then

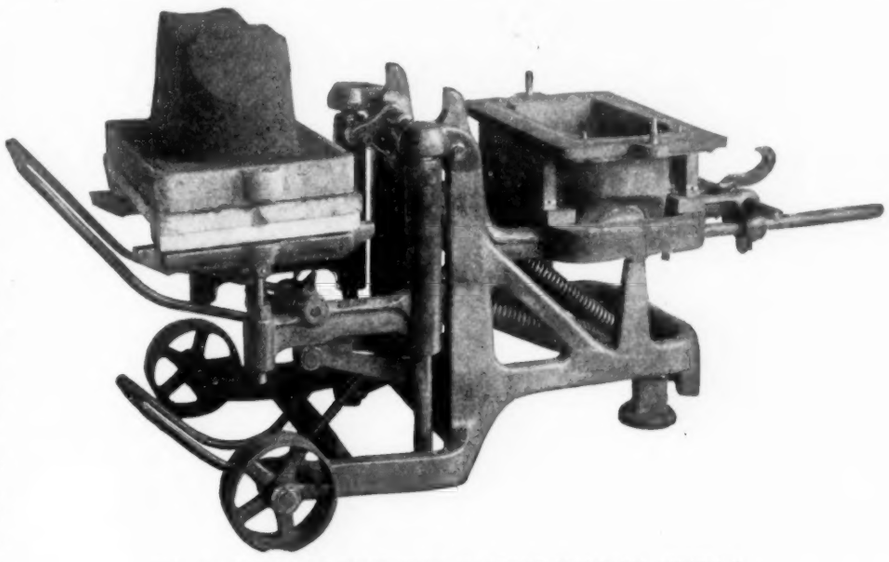


FIG. 10.—PRIDMORE ROCK-OVER MACHINE MADE BY HENRY E. PRIDMORE, CHICAGO, ILL.
(Pattern rocked back ready for fresh mold.)

the lever is thrown back to the original position which has the effect of lowering the pattern clear of the mold which is then ready for use without patching. There are few parts in the construction of the machine which are liable to get out of order even with the hard usage incidental to foundry work, the wearing parts are all brass bushed and the build of the machine is very rigid.

A useful modification of this type of machine is the rock-over form which is specially applicable for patterns with deep pockets. These produce hanging portions of sand in the mold which have a great tendency to drop off if the pattern were withdrawn downwards. Two illustrations serve to show this machine at the end of its cycle of operations, which consist of first ramming the box placed on the pattern plate, then clamping on a bottom board and rocking it over to the other side of the frame, where the flask and board rest on a stand. By pressing down the foot lever the mold is dropped away

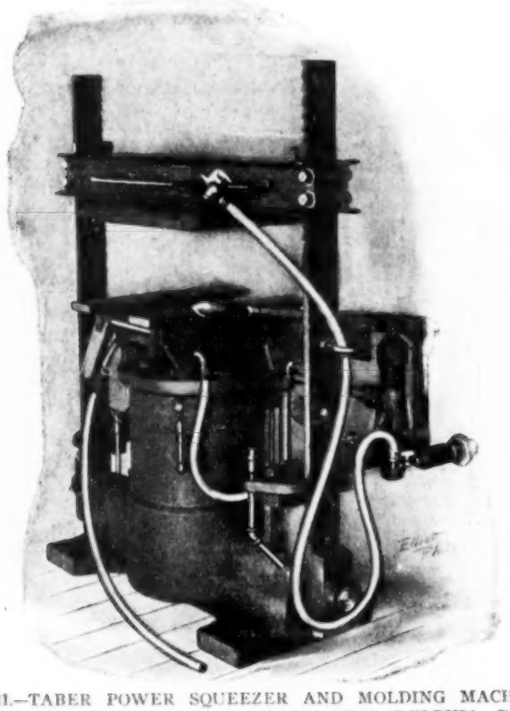


FIG. 11.—TABER POWER SQUEEZER AND MOLDING MACHINE. TABER MANUFACTURING COMPANY, PHILADELPHIA, PA.

from the pattern as shown in Fig. 9. By raising the lever the pattern swings back to its original position ready for a fresh mold, and the completed box is raised ready for lifting away as seen in Fig. 10. This form of machine is made portable and in view of taking a little longer to operate the rocking movement, it is less convenient for simple molds than the ordinary Pridmore machine, but possesses the advantage when dealing with deeply recessed patterns.

A simple portable type of hand squeezer is the Farwell machine which is useful for light work. Its chief point is the pressing head which, by a single operation, is brought into position over the moulding box full of sand and then pressed down upon it. A lifting table is used to elevate the mold and stripping plate off the pattern. For larger work in which the pressure required to compact the sand may be considerable, pneumatic power is frequently employed as in the Tabor power-draught machine shown in Fig. 11. The operation of this type of machine depends upon the use of split patterns which are mounted on the plate carrying the molding flask. Facing sand is first put in by hand, and the necessary floor sand added to fill the box, and also a small wooden hopper flask placed on top of it. Then the yoke is brought forward into the vertical position, and the compressed air admitted to the cylinder by depressing the hand lever. A pressure dial indicates when the sand has been brought to the requisite density and then the table is lowered, and the yoke swung back. Any excess sand is cleaned off and the drawing of the pattern is accomplished by raising the operating lever which causes the pattern drawing piston to rise carrying with it the flask frame and flask, and lifts the mold clear of the pattern. When the operating lever is raised to draw the pattern, is also serves to start a pneumatic vibrator which may or may not be kept running during the drawing operation. The use of the vibrator replaces rapping, and not only assists in the drawing of the pattern, but also assures uniformity in the size of the castings produced. The vibrator does not appreciably enlarge the mold, but simply overcomes the friction of the pattern against the sand, and consequently whilst a pattern without any draft can be drawn perfectly, care should be taken that there is no back draught. The amount of draught or withdrawal can be regulated by adjustable stops which prevent it from being excessive when using shallow patterns, and by means of buffer springs. The illustration further shows how the height of the yoke above the flask may be regulated for different depths of molding boxes, by means of notches in the strain bars, and the locking pieces which fit into the notches. In ordinary working conditions this type of machine does not require a stripping plate, but it is possible to fasten one to the flask frame to ensure perfect draw in exceptional cases. This form of power-machine relieves the molder of most of the heavy work of lifting, etc., and allows him to concentrate his energy upon achieving greater production. Uniformity in the density of the sand is obtained and consequently loss of castings due to swelling and blowing of the molds is reduced to a minimum.

PATTERNS FOR MOLDING MACHINES.

For all the above types of molding machines it is customary to use split patterns, which when they are symmetrical, only require to be parted through the centre, when they are suitable for cope and drag. When flat backed patterns are used, the pattern is mounted on the pattern plate for the drag half of the mold and a flat plate may be put on the machine for the cope half. Where patterns of this kind are utilized, it is usual to make a "floor" of drags and then to change the plate in the machine to make copes and close the mold, any necessary cores having previously been set. The fitting and care of the plates and patterns for these machines is best entrusted to a competent fitter, whose work it is to adjust patterns and fit the plates as well as the boxes. The cost of employing such a man in the foundry is often depreciated, but rather than have the work imperfectly performed by an ordinary molder who is seldom sufficiently conversant with the engineering practice needed for the accurate adjustments required, it is found that considerable saving in time and labor is effected by using the proper man. Some patterns used in split pattern work whilst not requiring stripping plates, have small pockets of hanging sand which almost invariably stick or drop off when the pattern is withdrawn. In such a case a hole is cut, either in the pattern alone or in the pattern and pattern plate, as required, and a stool used to support the projecting sand. These stools or props may be made of steel or hard wood, turned to the right size.

(To be continued.)

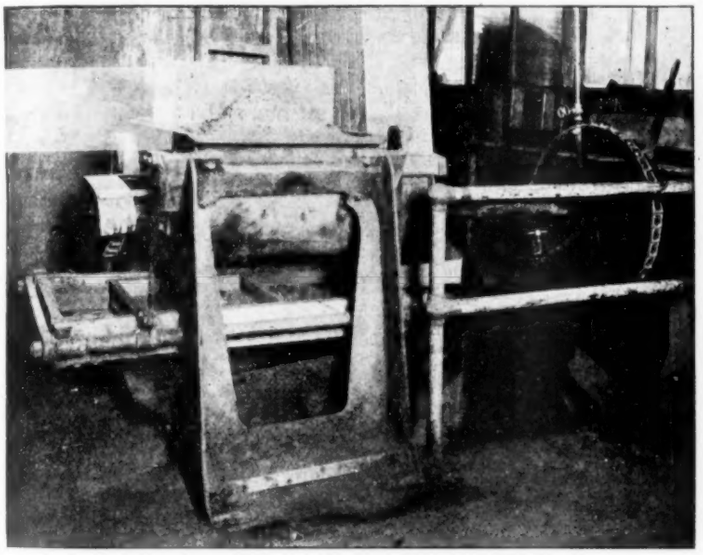
THE MAKING OF THIN-WALLED CASTINGS

A Description of Methods Pursued in the Manufacture of Cash Register Castings.

A Paper Presented at the Annual Meeting of the American Institute of Metals, September 11-15, 1916, at Cleveland, Ohio.

By R. S. B. Wallace, National Cash Register Company, Dayton, Ohio.

The method of making thin-walled ornamental castings of large area in brass and bronze has shown a wonderful evolution in the past few years. The old method of smoking, double-facing, and a large part of the drying, has been eliminated. At the present date excellent results are being obtained in making these castings by using the same method as would be used in the making of the same work in iron. In the present article the writer will describe the method used in the brass foundry in making the ornamental castings required for the cabinet, or outside case, of a cash register. The making of these castings can best be described by dividing the necessary operations into five classes, giving a brief description of each:



SAND RIDDLE UNDER THE HOPPER.

(1) Sand and its preparation.
(2) Equipment—flasks and machines.
(3) Molding.
(4) Metal and melting.
(5) Cleaning.

SAND AND ITS PREPARATION.

From experience we find that the more attention paid to sand, and especially the facing sand used in making thin-walled ornamental castings, the better the results obtained. More castings are thrown in the scrap heap due to the sand than to any other of the great many causes of bad castings, and after a number of experiments the following method was found to give the best results:

A fine heavy-bonded Albany sand is used in making the facing and is added in the proportion of one part new Albany sand to six parts old sand, adding six ounces of salt to each gallon of water used. The new sand is dried in a large drying bin, in which there are a number of steam pipes, until it will pass through a No. 40 mesh sieve. If necessary, it is milled before being placed into the sieve, but, of course, any small stones that may be in it are first removed. After the sand has been riddled it is placed in bins convenient to the sand mixing machine. Uniformity of the mixture of old and new sand is controlled by the sand hopper on this machine, which has two compartments both containing worms geared in the ratio of one to six. The sand, after being moved out of the hopper by the worm, falls on a riddle. This riddle is suspended from the hopper by four flat springs made of Nova steel, and is operated by compressed air. It is 3′ 2″ long by 20″ wide, fitting closely to the sides of the frame and held at the ends by wood blocks. The frame which holds this riddle is 4′ long and 22″ wide. The frame and riddle are slightly higher at the discharge end, keeping the sand at the end of the riddle nearest the cylinder, but does not keep the coarse material from passing out through the opening at the end of the riddle. Two cross bars are placed in the riddle about 12″ apart and 12″ from the end. This breaks the lumps in the sand and a ½″ clearance above the screen allows the coarse material to pass through. All the small particles of rust and foreign matter in the heap sand are thrown out at the discharge end, which, with another style of riddle, is broken up and passed through the screen.

After the sand has been prepared it is allowed to stand at least twenty-four hours, which gives it time to temper. It is then delivered to the molder, being placed in specially provided boxes convenient to his place of work.

The sand used in the heap should be as open as possible so as to allow the gases to leave the mold freely when being poured. By using a facing sand the heap sand is not so important—coarser grades can be used. Plenty of new sand should be used in the heap as it will become closer with each day's use. We find it much better to add a shovel of new sand after each heat rather than large quantities at one time.

EQUIPMENT.

All flasks used are made of cast iron and have machined joints. Due to the closeness with which it is necessary to work, little sand bearing is allowed, and when the parts of the flasks are clamped together the joints fit close so the edges of the mold will not crush. It is very important that the back plates be straight, and when boards are used care should be taken that they do not become warped, as castings which require a uniform thickness cannot be made if the plates or boards are not straight. When castings of large area are made the pattern should be placed on hard sand or a plaster match, and it is very essential that the pattern be not allowed to spring as mis-run or oversize castings will be the result.

Where the usage will warrant, a pattern plate is used, and molds are made on a molding machine. In this case a match is used under the pattern plate to avoid springing of the pattern when being rammed.

All molding tubs and machines are equipped with vibrators which eliminate the rapping of the pattern and more uniform castings are obtained. All molding machines are equipped with lifting devices, which permit the making of a mold with very small degrees of draft, less skill being required especially where deep lifts are made.

In all cases the mold is lifted from the pattern. Great care is given the flask pins, and pin holes in flasks and pattern plates, as shifted castings, which cannot be used, are the result if these parts become worn. No molder is allowed to tighten or loosen pins; this is done in the machining department, where they are properly equipped

with tools and templet to adjust the flask pins. A steel machined strike-off is provided each molder, or machine operator, which is checked up for accuracy at frequent intervals by the foreman. This is very essential as hollow or high place in the back of a mold will cause mis-run or oversize castings. So with straight back plates and a straight back to the mold uniform castings are assured.

A number of different makes of molding machines are used. Each type being equipped for a special class of work or for the work for which it is best adapted. In the use of the lifting device it is necessary that the lifting pins are at all times carefully adjusted. Air gauges are used on the power machines so that each job can be rammed as hard as required and all the molds rammed alike.

MOLDING.

Whether a mold is made on a machine, tub or floor the process and operations are very much the same. All tools required by the molder are furnished by the company, and the molds must be made according to the instructions given by the foreman. The pattern is placed in position and the flask is put over the pattern. Where a flat surface is formed pulverized charcoal is used as a parting; where lifts are necessary a partine compound is used. Pulverized charcoal is given the preference because it does not stick to the pattern, therefore, the finer details in the casting are brought out much sharper. After the parting material has been put on the pattern a thin layer of facing sand is next riddled over the pattern, using a No. 10 mesh sieve. Then a shovel of heap sand is riddled over it, using a No. 4 sieve. This is done to cover the pattern with a layer of sand without the sand being moved on the pattern, which is often the cause of castings showing a roughness along the edges of the ornaments or border, commonly known in the foundry as a "ram-off." In shoveling sand in a mold that has a very light layer of riddled sand over the pattern the sand may slide, and therefore the rough edges on the casting. A mold must be rammed firm and evenly, the sand around the edges of the flask peened, and then rammed hard enough so as to remove any danger of the mold sagging. If this is not done the mold sags and mis-run castings may be the result. The general rule followed is to work the sand as dry as possible, which, when properly rammed, will give a good casting. Wet sand is always to be guarded against as much as possible as a large number of spongy castings are due to wet sand and not to metal faults, as is most often believed. After the mold is rammed it is struck off carefully so as not to leave any high or low spots in the back of the mold and a small amount of sand is placed upon the back of the mold and the plate or board firmly bedded. When the mold is lifted from a drag or pattern plate it should be handled in such a way as not to be jarred as this is the cause, in many instances, of mis-run castings.

Gates are attached to all patterns, as cleaner castings are assured when gates are rammed with the pattern, than to have them cut by the molder after the mold is rammed. A small amount of flour is shaken on the mold, using a sack for this purpose; care being taken to blow off the surplus from the mold before the moisture in the sand takes hold of the flour—just a thin film being required. Excessive use of flour would make a rough casting. The mold is now ready to be closed after being blown off by the bellows. The mold, if exposed for a few minutes, will have a sediment of fine dust, which is in the air of all foundries, and must be removed from the mold. The mold should be clamped very firm, as heavy or over size castings would be the result if not clamped hard enough to withstand the pressure of the metal when the mold is poured.

A few years ago it was thought necessary to dry all molds for both brass and bronze, but at present only molds for brass castings having large area are dried; in some cases good results are obtained by drying one side only, the other side being entirely green. It was also thought necessary to pour all castings with the ornament or face side down. This rule is not always carried out now as we find that ornamental castings, with deep borders or high ornaments, can be made cleaner and sharper by pouring face side up.

METAL AND MELTING.

The thickness allowed in the main body of all castings of register cabinet parts is .10 of an inch. Therefore very hot metal is essential, and the rule is strictly carried out that the molder must be ready for his metal when it has reached the proper temperature. All the metal used for casting purposes is melted in coke-fired pit furnaces, our foundry being equipped with 175. These are made in three sizes, the smallest take in up to a No. 30 size crucible; the next up to a No. 40 size and the largest up to a No. 60 size. From three to six heats a day are taken from each furnace, depending upon the amount of metal required. Each molder has a furnace allotted to him which is in the care of a melter, who is held responsible for the melting. Each melter is required to look after five furnaces. To avoid confusion in handling such a large number of heats, required for a day's melting, a melter's record card is used. One copy of this goes to the melter with the metal and the other is delivered to the foundry office, where it is used as a check against the foundry by the stock room that issued the metal.

Forty different alloys are used in the various parts of cash registers, but for cabinet parts, only two are used. The bronze finish parts are a composition of:

Copper	86.0	per cent
Tin	1.5	" "
Lead	11.0	" "
Zinc	1.5	" "

1/20 of an ounce manganese copper per pound of copper.

The nickel-plated parts are a composition of:

Copper	70.5	per cent
Zinc	26.5	" "
Lead	2.0	" "
Tin	1.0	" "

In all mixtures the zinc, tin and lead are made into alloys which reduce the cost of weighing the necessary metals and eliminate the chances of error. For the bronze finished mixture it is very important that the metal be of the same composition at all times, as the various parts of a single cabinet may be made by a dozen different molders and a dozen men may have melted the metal, but when the parts are assembled they must match in color.

In melting the metal it must at all times be covered with charcoal. After the crucible has been placed in the furnace, and the necessary coke placed around it, a few pounds of gates or scrap metal of the same composition required in the heat, are placed in the bottom of the crucible, and the copper is placed across the top of the crucible at the same time. By the time the gates are melted the copper is ready to be placed in the crucible and as the copper melts it falls into the bath of metal made by the melting of the gates. After the metal has become properly melted the necessary alloy is added in proportion to the amount of copper. At this point the metal should not stay in the crucible over ten minutes, which

is ample time for the alloy to become mixed with the copper and be brought up to the required pouring temperature.

CLEANING.

PREPARING BRASS CASTINGS FOR INSPECTION AFTER LEAVING THE FOUNDRY.

Castings are conveyed to the cleaning room on industrial railway trucks, care being necessarily used in loading so as not to scratch the ornamental side of the casting. The first operation in the cleaning room is to brush the sand from the casting. This is accomplished by revolving circular wire brushes which are attached to a universal jointed shaft over openings in a bench. These openings are connected with an exhaust for carrying off the sand and dust. The parts are then passed to the band saws, where the gates are sawed off. The band saws used on these machines are 18 feet long, ½ in. wide and have 14 teeth to the inch. The saws are carried over wheels 3 feet in diameter, running 375 r. p. m. The work is then passed on to the grinding lathes, where the gates are ground off and any burrs or rough edges on the castings removed. The grinding is done on circular carborundum wheels 16 inches in diameter, operated at a speed of 1,200 r. p. m. From the grinder the castings go to the dipping job, where they are pickled to clean off any sand stains and sand not removed by the first operation of brushing. The pickling operation consists of placing the castings in large bronze racks, which carry about 500 pounds of cabinet castings and immersing them in a diluted solution of hydrofluoric acid one part acid to six parts water, for about 30 minutes. The baskets, or racks, are transferred from point to point by means of a trolley system and raised and lowered by an electric hoist. After the castings have been in the pickle the necessary time they are rinsed in consecutive baths of cold and hot water and then placed in the drying oven until thoroughly dry, when they are delivered to the inspector.

HEAT TREATMENT OF BRASS IN NEUTRAL AND REDUCING ATMOSPHERES *

SOME INFORMATION OF INTEREST TO BRASS MANUFACTURERS.

PAPER READ AT MEETING OF MICHIGAN GAS ASSOCIATION HELD IN DETROIT, MICH., SEPTEMBER 22, 1916.

BY ALFRED H. WHITE, PROFESSOR OF CHEMICAL ENGINEERING, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., AND BERT A. STANDERLINE, HOLDER OF MICHIGAN GAS ASSOCIATION FELLOWSHIP IN GAS ENGINEERING AT THE UNIVERSITY OF MICHIGAN.

INTRODUCTION

When copper and zinc are melted together to form brass, and when brass billets or other articles are heated in annealing furnaces there is a material loss of metal. This loss is due in part to volatilization of the metal which is evolved as metallic vapor and is usually changed to oxide that passes away with the fume and is in part due to direct oxidation of the solid metal to form a scale which remains on the metal.

The volatilization of the metal is theoretically independent of the composition of the gases surrounding it and if the reaction takes place in a closed vessel and if sufficient time is allowed to attain equilibrium, is dependent only on the volume of the gases, the composition of the alloy and the temperature to which it is exposed. The relation of the temperature and the composition of the brass to the volatilization has been studied by Thorneycroft and Turner* and is not discussed in this paper.

The volume of the gases surrounding the metal affects the volatilization materially for the amount of metallic vapor which a gas may hold is constant for a given temperature and pressure and therefore in practice the greater the volume of gas and the more rapidly it is circulated over the metal the greater will be the volatilization in a given time. Theoretically the composition of the gas does not affect the volatilization of the metal but this does not hold in practice for the metallic vapors become converted to oxides in an oxidizing atmosphere and equilibrium being thus destroyed, further amounts of metal volatilize. This is the case in the ordinary heat treatment of brass since both zinc and copper are readily changed to the oxides.

Copper-zinc alloys will suffer least loss in heat treatment at a given temperature if they are heated for as short a time in as small a volume of neutral gas as is possible. The small volume of gas may be attained if the metal is placed in a covered crucible as is done in the melting of brass or by the use of an externally fired muffle furnace. When, however, the door of the muffle must be opened frequently and the air space in the muffle is large, the circulation of the air within the muffle nullifies its advantage. An externally fired muffle also involves low fuel efficiency and a longer time to bring the metal to the desired temperature. There is also uneven heating in a muffle furnace, the material near the hot walls being necessarily heated more rapidly than in the center.

In a paper presented before this association last year** as one of the results of your co-operation with the University of Michigan it was shown that it was possible to heat iron or steel to a temperature of 2200° F. for an hour without more than traces of oxidation, by exposing them directly to the gases formed by the combination of one volume of coal gas with about two volumes of air. The furnace used was a muffle heated both internally and externally. The mixture of gas with two volumes of air burned at the entrance to the muffle, the products of incomplete combustion passed through the muffle over the metal and out at the farther end where they mixed with more air, burned completely and passed back around the muffle. The theoretical temperature to be obtained from the combustion of one volume of coal gas and two volumes of air is 2250° F. and with the aid of the secondary combustion outside of the muffle an actual temperature of 2200° F. could readily be maintained within the muffle.

Under these circumstances about 27 per cent. of the available heat was liberated in the primary combustion within the muffle and the remainder in the secondary combustion around the muffle. Of the products of combustion, steam and carbon dioxide as well as any excess of oxygen act as oxidizing agents while hydrogen, carbon monoxide and any hydrocarbons act as reducing agents. With two volumes of air to one of unenriched coal gas the reducing agents have approximately 1.75 the volume of the oxidizing agents while with 2.4 volumes of air to one of gas the reducing agents are still one and a half times as great as those which are oxidizing.

A gas of this neutral composition may be obtained from the partial combustion of natural gas, petroleum, coal gas or carburetted water gas. Producer gas as it comes directly from the producer may have also approximately this composition although especial care would have to be given to the operation of the producer to obtain it, and it would be of variable composition. It would

*Journ. Inst. of Metals, Vol. 12, p. 214 (1915).

** Heat Treatment of Iron and Steel in a Neutral Atmosphere, by Al H. White and Hor T. Hood, Proc. Mich. Gas Ass., 1915, p. 57.

have to be used hot as it came from the producer and only its sensible heat would be available for heating the material within the muffle since if air were introduced for partial combustion it would raise the proportion of oxidizing gases. Walker* has shown that it is practicable to use producer gas in annealing sterling silver which contains 92.5 per cent. of silver and 7.5 per cent. of copper.

EXPERIMENTAL METHOD.

The general method was the same as that used formerly for the study of the heat treatment of steel. The furnace was a vertical muffle furnace consisting of a quartz tube with a Meker burner luted into the lower end. Both the gas and air entering this burner were metered and as the mixture of air and gas rose within the tube the work with brass it was necessary to put in a checker work of refractory material over the gas inlet. This checker work became hot during the preliminary heating of the muffle with full oxidizing flame and maintained its heat during the subsequent operation with the reducing flame.

The experiments were conducted entirely on the laboratory scale and on three sets of materials—commercially pure copper, brass with 90 per cent of copper and 10 per cent. of zinc, and brass with 70 per cent. of copper and 30 of zinc. In ordinary commercial operations both the volatilization and the oxidation are dependent on the amount of surface of the piece rather than its weight. The material used in these tests was therefore always rolled into thin foil to give more surface, and in order to get this

TABLE I.

SUMMARY OF TESTS ON COPPER AND BRASS HEATED FOR ONE HOUR IN AN ATMOSPHERE FORMED BY THE INCOMPLETE COMBUSTION OF COAL GAS AND AIR.

No. of Sample	Temperature Max. °F	Temperature Min. °F	Ratio Air: Gas	Area Test Piece Sq. Ins.	Initial Weight Grams	Change in Weight Loss Grams	Change in Weight Gain Grams	Appearance After Test
A	**Commercial Copper**							
5	1,162	932	2.93	8.32	1.5370		0.0007	Dark in spots
15	1,139	1,087	3.10	8.72	1.8089		0.0006	Bright
16	1,177	1,123	3.00	8.50	2.1628		0.0013	Very slightly dull
B	**Brass with 90 Copper and 10 Zinc**							
22	1,060	1,009	2.93	4.50	0.9032		0.0008	Dull copper color
23	1,087	1,038	2.86	5.00	1.0078		0.0006	Dull copper color
24	1,526	1,501	2.55	4.81	1.0778	0.0475		Dull copper color. Carbon deposited
25	1,504	1,474	2.55	5.00	1.3067	0.0388		Dull copper color. Carbon deposited
26	1,224	1,206	3.21	4.71	1.0270		0.0001	Gray
27	1,242	1,215	3.18	5.39	1.2375	0.0000	0.0000	Oxidized
C	**Brass with 70 Copper and 30 Zinc**							
1	1,197	1,024	3.81	10.00	3.1569		0.0025	Gray
3	1,798	1,724	1.33	11.52	3.5680	0.8370		Carbon dep'd. Partially fused. Copper color
4	1,582	1,461	1.93	9.96	3.3296	0.1142		Party gray, partly copper color
6	1,629	1,508	2.33	7.38	2.5188	0.1273		Fairly bright copper color
8	1,114	1,067	3.10	8.50	2.8698		0.0015	Gray
9	1,130	1,062	3.19	6.84	2.3095		0.0007	Grayish brass color
10	1,526	1,468	2.23	7.00	2.2048	0.2900		Carbon deposited. Copper color
11	1,656	1,603	2.23	7.86	2.1200	0.3377		Dull copper color
12	1,405	1,249	3.02	7.38	2.3231	0.0215		Grayish brass color
13	1,220	1,189	2.91	8.11	2.2870	0.0003		Grayish brass color
14	1,141	1,114	3.33	7.50	2.2216	0.0022		Grayish brass color
18	1,209	1,188	3.81	6.09	2.2632	0.0004		Dull yellow brass color
19	1,215	1,186	3.27	6.20	2.3222	0.0007		Grayish brass color
20	1,233	1,143	3.28	6.00	2.1260		0.0001	Light gray brass color
21	1,162	1,137	3.27	5.86	2.1200	0.0018		Light gray brass color

and became heated it ignited so that the test piece hanging in the upper part of the muffle was surrounded only by the combustion gases. These gases of incomplete combustion passed out openings in the cap of the quartz tube into an annular space where they met secondary air sufficient for complete combustion and then passed down around the quartz tube and out of the furnace. A sketch of this furnace was given in the previous paper.

The heat treatment of brass does not involve such high temperature as the treatment of steel but the volatilization of the zinc and the readier oxidation of both zinc and copper complicate the situation.

An unexpected complication in furnace construction was also introduced by this lower temperature, for a mixture of coal gas with even three volumes of air does not burn unless preheated. With the higher muffle temperature used in the work on steel the gases were satisfactorily preheated as they progressed into the muffle. In

* Jour. Am. Chem. Soc. 29, 1198 (1907).

into a compact volume it was rolled into a loose spiral which was hung in the furnace with its axis parallel to the travel of the gases. This spiral was introduced into the preheated furnace and allowed to remain one hour. Special care was necessary in removing it from the furnace since the oxidation during the few moments required for cooling in the air would have been much greater than that involved in the furnace treatment of an hour. The spiral was chilled before removal from the furnace by lowering a short cast iron tube into the furnace and raising it so that the spiral dropped inside. The relatively heavy mass of the cold iron chilled the thin spiral so that it could be withdrawn without oxidation.

The changes in this foil due to the heating were determined by the change in weight and the visual appearance. Since the thickness of the foil was usually less than 0.008 inches, superficial alteration would have been delicately shown by the change in weight had it not been for the compensating action of the different changes. Volatilization of metal decreases its weight while oxidation in-

creases it. It is possible, therefore, to have a loss due to volatilization exactly compensated by an increase due to oxidation. The appearance of the surface indicates, however, when there has been material oxidation.

The gas used was in every case an unenriched coal gas of 600-615 B. t. u. per cubic foot. The composition of the products of incomplete combustion, their temperature and the thermal efficiency of the process were discussed in the former paper.

EFFECT OF HEATING COPPER AND BRASS IN A NEUTRAL ATMOSPHERE.

Commercial copper foil when heated in the gases formed by burning one volume of coal gas with three of air does not suffer an appreciable oxidation in an hour at a temperature as high as 1178° F. The change in weight under these conditions is negligible and the bright surface of the copper is scarcely tarnished. Details of the test are given in Table 1. The behavior of copper at 1500° F. is indicated by tests 24 and 25 of the alloy with 90 copper and 10 zinc where with 2.5 volumes of air to one of gas the zinc was volatilized from the surface which was left a dull unoxidized copper color. A similar phenomenon was shown with the alloy having 70 copper and 30 zinc at high temperatures up to 1798° F. as shown in tests, 3, 4, 6, 10 and 11.

It is concluded that copper can be heated in this way to any temperature up to nearly its melting point without material scale formation.

The behavior of brass with 90 parts of copper and 10 of zinc is shown in tests 22 to 27. At 1060 and 1087° F. there was little effect due to an hour's heating in a mixture of 2.9 air to 1.0 of gas, the color being almost unchanged and the loss in weight trifling. At 1224 and 1242° with slightly more oxidizing conditions (3.2 volumes of air) the surface became gray and oxidized but the weight was unchanged, the increase of weight due to formation of oxide being evidently compensated by the volatilization of the zinc. At 1500-1526° F. with a still more strongly reducing atmosphere (2.55 volumes of air) the metal became somewhat coated with lamp black but when this was brushed off it was found that the surface was oxidized but had assumed a dull copper color due to volatilization of zinc from the surface. If the entire loss of weight can be laid to zinc it indicates that about 40 per cent. of the zinc was volatilized. This is apparently a large loss but when it is considered that the foil was only 0.008 inches thick it is seen that this amount of zinc could have come from a surface layer only 0.0016 inches thick.

The brass with 70 per cent. copper and 30 per cent. zinc was given more attention than the others. This brass tarnished more readily than the others and it was difficult under any conditions to prevent it from showing a gray surface. At temperatures below 1250° F. (tests 1, 8, 9, 13, 14, 18, 19, 20, 21) with from 2.9 to 3.8 volumes of air to one of gas the change in weight was negligible and was sometimes a gain and sometimes a loss. At 1405° F. (test 12) with 3.02 volumes of air the loss in weight was about 0.9 per cent. of the total weight or 2.7 per cent. of the total zinc. At higher temperatures even with stronger reducing conditions the loss in weight was still greater.

In test 6 with 2.33 volumes of air to one of gas and a maximum temperature of 1628° F. the surface was a fairly bright copper color showing that almost all of the zinc near the surface had been volatilized. The loss in weight was about 5 per cent. of the total weight of the brass corresponding to 15 per cent. of the weight of the zinc.

At 1655° as shown in test 11 the result was similar with a loss in weight of 16 per cent. corresponding to a removal of zinc from a layer only 0.002 inches thick. The melting point of this brass is about 1760° F. and in test 3 this temperature was approached at the beginning of the test (1724°) and surpassed at the end of the test (1798°). The brass heated for an hour under these conditions in a strongly reducing atmosphere made by combining one volume of coal gas with 1.33 volumes of air became coated with carbon but on brushing this off the metal was a dull copper color showing occasional holes and fused globules of bright copper. The loss in weight was 23.4 per cent. corresponding to 78 per cent. of the total zinc, or the amount of zinc coming from a layer 0.003 inch thick. It is thus shown that brass can be heated, even up to its melting point for an hour in a stream of neutral gas with only trifling surface changes.

SUMMARY.

The method described a year ago for heating iron and steel in a neutral atmosphere has proved itself advantageous also for brass and copper. Copper is not oxidized when exposed directly to the products obtained from burning coal gas with an insufficient amount of air, the proportions of gas and air varying with the temperature to be reached. Up to 1200° F. three volumes of air to one of gas may be used, and still smaller proportions of air must be used for higher temperatures. The volatilization of the zinc from brass is primarily a function of the temperature but can be reduced to a minimum by rapid heating and a neutral atmosphere which limits the loss to that due to temperature and largely eliminates that due to oxidation.

This rapid heating in a neutral atmosphere can be readily obtained in a muffle within which coal gas is burned with an insufficient supply of air and around which these products of combustion are burned with additional air. The pieces placed within the muffle are thus rapidly and evenly heated with a minimum loss of weight due to volatilization of the zinc. The loss of zinc after brass with 70 copper and 30 zinc was heated to almost its melting point for an hour amounted to an elimination of zinc from a layer only 0.003 inch thick. With lower temperature even more favorable results were obtained.

The actual commercial value of this process can only be determined after tests on a large scale. There is every reason to believe that with proper design of furnace it will be successful.

SILVER IN MOVING PICTURE FILMS.

The Metal Mining Journal says: "The moving picture industry is using a large amount of silver. There are about 20,000 picture houses in the United States, using approximately 120,000,000 feet of film regularly. The average life of a film is three weeks. Silver salts, used for sensitizing, are lost forever on being exposed to the light. It is estimated that 15,000,000 ounces of silver a year—a figure equal to Utah's total production—are used for this purpose."

PLATING AEROPLANE PROPELLERS.

In consequence of the weight of metals, wood is used for aeroplane propellers. To protect them, and also to reduce the resistance, it is customary to varnish and polish the wood, but varnish soon wears off and the wood becomes roughened. As a remedy for this it is proposed to coat the wood with metal by the Shoop metal-spraying process, and, for this, aluminum has been found very effective. Applied by this process, the metal clings firmly to the wood, especially if applied before the wood is finally smoothed. The plates can then be given a fine and lasting polish.

DETERMINING WEIGHT OF DEPOSIT

SOME VALUABLE SUGGESTIONS FOR THE CHEMICAL DETERMINATION OF ELECTROLYTICALLY DEPOSITED METAL

WRITTEN FOR THE METAL INDUSTRY BY L. C. WILSON.

(Continued from September.)

ZINC.

Zinc is the most widely used of all the metals employed for purely protective coatings, since it is so strongly electro-positive in nature that it affords more protection against corrosion to iron or steel, per unit weight, than any of the other metals in ordinary use. In doing this it plays a dual role.

In the first place it acts as a shield, to keep the surface of the iron from coming in contact with water and the atmosphere and then when oxygen and water do finally succeed in breaking through, it heroically sacrifices itself in order that the underlying metal may be saved. The modern theory of corrosion explains this rather peculiar phenomenon by saying that electric currents are set up in the iron through the action of moisture and the gases of the air; under these circumstances, since zinc is electro-positive to iron, it becomes the anode or positive pole and the iron the cathode or negative, so that the current flows from it to the iron, the former being slowly dissolved and the iron protected until the zinc has been removed or greatly reduced in quantity.

For many years iron articles have been coated with zinc by dipping them in a bath of the molten metal, using some flux to produce the necessary degree of cleanliness, but the electro-deposition of the metal was not a commercial proposition until more recent times. Now, books on plating give a number of formulas for solutions and several firms are exploiting patented or secret baths. Some of these give very good deposits, but there is still room for improvement and great advances will undoubtedly be made in the future.

The latest method of application is known as sherardizing and produces a finish which is remarkable in many ways. It is carried out by heating the parts in finely powdered zinc oxide containing a considerable proportion of metallic zinc to a temperature around 700 deg. F. Under these conditions an outside coating of more or less pure zinc, covering a layer of a number of alloys containing varying amounts of zinc and iron, is deposited on the surface of the parts and affords very efficient protection from corrosion.

Inasmuch as the operator may be called upon to determine the weight of a deposit produced by any of the above methods the procedure in each case will be given, and a few facts about the metal itself may make this clearer.

Metallic zinc is bluish-white, with a specific gravity of 6.9; it melts at 420 deg. C. and boils about 950 deg. C. It can be highly buffed and will retain its luster in dry air, but tarnishes slightly in moist air or water. When heated to a high temperature in the air it burns with a bluish flame, forming zinc oxide; it is rather brittle at ordinary temperatures, breaking with a coarse, crystalline fracture. It is fairly malleable at 100 deg. C. to 150 deg. C. and may be drawn into wire or rolled into sheets, but when heated higher becomes brittle again and at 205 deg. C. may be powdered in a mortar.

Pure zinc dissolves very slowly in acids or alkalies, but the impurities in the ordinary grades of metal cause it to go into solution rapidly. In contact with iron it is quite rapidly oxidized in water containing air, but it is not dissolved by water alone.

Perhaps the most convenient method of estimating zinc is by the use of a standard solution of potassium ferrocyanide, $K_4Fe(CN)_6$. To make this, weigh out 41.25 grams of the pure, crystallized salt and dissolve in a small quantity of distilled water, then dilute to 1,000 c.c. with same. This should be standardized as follows:

Weigh out carefully about 0.2 gram of pure zinc and dissolve in 10 c.c. strong hydrochloric acid in a large, covered beaker. Wash down the sides and cover with a jet from the wash bottle, then put in a small piece of litmus paper and make faintly alkaline with ammonia. Acidify slightly with hydrochloric acid then add 3 c.c. excess of strong acid, dilute to about 250 c.c. and heat nearly to boiling. Titrate with the ferrocyanide solution, using a solution of uranium nitrate as an outside indicator on the spot plate. In carrying out the titration, it is best to pour off about a third of the zinc solution and set it aside in a beaker.

Run in a few cubic centimeters of the ferrocyanide solution at a time, stirring thoroughly after each addition, until a drop taken out and placed on a drop of the uranium solution on the spot plate shows a brown tinge. Now add the greater portion of the reserved solution and continue the titration until the endpoint is again passed. Finally add the last of the reserve portion and to save rinsing pour a large part of the solution back into this beaker, then add it to the main portion and finish the titration very carefully, testing after each addition of each two drops of ferrocyanide and stopping at the appearance of a faint, permanent brown. To insure a sharper reaction, a quantity of solution equivalent to several drops may be taken toward the end of the titration, as the amount of zinc lost will be very small. By using a glass tube instead of a rod for stirring, any desired quantity of the solution may be withdrawn for test. When the final brown tinge is obtained, note the burette reading and then wait a minute or two and see if one or more of the preceding tests do not develop a color; the endpoint is always passed by a test or so and the reading must be corrected accordingly.

It is well to run a blank test using the same amount of solution and under the same conditions, except that no zinc is present, in order to determine the quantity of ferrocyanide which is required to produce the brown color and this amount must also be subtracted from the burette reading.

Knowing the amount of ferrocyanide required to precipitate all of the zinc, and the weight of this taken, the value of the solution may be found by dividing the weight of zinc by the number of cubic centimeters required. Thus, if 0.21 grams zinc were taken and required 23 c.c. of ferrocyanide, $0.21 \div 23 = .0091$ therefore each cubic centimeter of the latter is equivalent to .0091 g. zinc.

If preferred, a standard solution of zinc sulphate

*Descriptions and illustrations of the apparatus needed to carry out the analysis described in this article are contained in an article by the same author, published in May, August and December, 1914.

may be prepared by dissolving 43.99 g. pure zinc sulphate in a small quantity of distilled water and diluting to 1,000 c.c. with same. Take out 10 c.c. of this solution with a pipette, run into a beaker and proceed as before.

It should be noted that ferrocyanide solution is sensitive to light and decomposes more or less easily, therefore should be kept in a brown bottle, or one covered with black paper and not exposed continuously to strong light. A check determination should be made every little while, to insure correct results.

The ferrocyanide method is widely used for the estimation of zinc and when properly carried out gives very satisfactory results. If the conditions are not right, however, or the work carelessly or improperly done, misleading results may be obtained.

Of the other methods of estimating this metal, probably the electrolytic is most likely to appeal to the plater, as it is fairly simple and when performed with reasonable care gives accurate results. The procedure is as follows: Pipette 10 c.c. of the zinc solution into a beaker and neutralize carefully with sodium carbonate solution. Owing to the difficulty of removing the zinc deposit from the platinum dish or cone, it has been suggested that these be given a copper coating of medium weight, which may be done by thoroughly cleaning the parts and then electrolyzing a strong solution of copper sulphate with them, for a few minutes. When they are sufficiently coated, they should be well rinsed in distilled water, then in alcohol, dried and weighed. When this is done, pour the zinc solution into the platinum dish, or a beaker, add about 5 g. potassium oxalate and 2 g. potassium sulphate dissolved in a little water and set up the apparatus. The spiral should be connected to the positive or anode side of the current, while the cone or dish should form the cathode or negative. A current of one ampere at a tension of 3 to 4 volts will give a good deposit.

All of the metal should be out of solution at the end of two or three hours, then the cone should be lifted out of the liquid, without breaking the current, and washed in distilled water, dipped in alcohol and dried at a low temperature. It must be weighed soon after cooling.

To make sure that all of the zinc has been deposited, the cone may be replaced and the current turned on again for an hour or so. The cone should then be removed, washed, dried and weighed as before. A slight increase in weight, .01 g. or so, may be disregarded, as it is almost always obtained and is likely due to a small amount of platinum being dissolved off the spiral and deposited on the cone.

A further very simple method of estimating the weight of zinc on a part depends on the solubility of this metal in strong sodium or potassium hydroxide. Iron is not appreciably attacked by this solution, so it is possible to determine the weight of zinc, especially an electrolytic deposit, with a good deal of accuracy, by cleaning the part in alcohol, weighing after it has become dry, then placing it in a strong, boiling solution of the caustic. A clean piece of iron put into the liquid also will hasten the action. The zinc is more or less rapidly attacked, hydrogen being liberated vigorously, and as soon as the action ceases the part is removed, washed in distilled water, dipped in alcohol, dried and weighed. The loss in weight over the previous weighing represents the amount of zinc which had been deposited, and removed, and by dividing this weight by the area we can move the decimal point three places to the right and express the result as milligrams per square inch. Of course, this indicates the average deposit and gives no idea as to the maximum or minimum. This point will be taken up later.

This method may be used with hot dipped or sherardized parts also. In the first case, no particular difficulty is experienced, but in sherardizing a considerable amount of iron-zinc alloy is formed, as mentioned before, and it has been claimed that this is not attacked by the alkali, but it seems likely that the greater part, if not all, of it can be removed by boiling long enough.

Zinc is so widely used as a protection for steel and iron that many attempts have been made to devise some short and simple test which would give more or less accurate information regarding the quality of the coating. This article would not be complete without some reference to the Preece or copper sulphate test. This depends on the fact that when zinc is dipped in a strong solution of copper sulphate it goes into solution and copper comes out, in metallic form. As soon as the zinc is removed from the iron, the copper begins to plate out more slowly and forms a deposit which can easily be seen. The difference of solution pressure is much greater as between zinc and copper than between iron and copper, so the latter replaces the zinc with such rapidity that a crumbly deposit is formed, which is easily wiped away. The copper-iron exchange, on the other hand, takes place so slowly that the copper plates out as a fairly hard film. The appearance of such a coating, therefore, is an indication that the zinc is gone.

On the whole this test is only a quick and approximate method of determining the thickness of the deposit at its thinnest point and cannot be interpreted too closely as a measure of the life of the coating under the conditions of service. The main difficulty in carrying out the test, which is applied more generally to hot dipped work, is that the endpoint marking the removal of all of the zinc is not always easily distinguished. Certain modifications and precautions are necessary in applying it to sherardized work, but in experienced hands it is of value and finds a wide field of usefulness.

In the previous articles of this series it has been noted that electro-plated deposits are not usually of uniform thickness, and methods have been given whereby the areas of high and low deposit may be found. These comprise dipping the part in melted beeswax, then cutting narrow channels through it in various directions and immersing in some acid. By noting the spots from which the coating is removed first, then the other places in turn, a good deal of data may be obtained regarding the distribution of the plated coating on the surface of the part. In applying this test to electro-galvanized parts, however, it is sometimes difficult to tell just when the zinc is removed, so it is better to copper-plate the part first, then apply the zinc in the regular manner and under the same conditions as in practice. Then wash and dry, apply the beeswax and explore as directed previously, using dilute hydrochloric acid. The underlying copper coating is easily seen when the zinc is dissolved off, and there should be no difficulty in obtaining the desired data.

In the case of hot dipped or sherardized parts, plating with copper would hardly be possible; but, on the other hand, it is not likely that it would be desired to test them in this way, inasmuch as the latter method produces a very uniform finish, and hot dipping is generally not very far behind in this respect.

(To be continued.)

EDITORIAL

OLD SERIES
Vol. 22. No. 12.

NEW YORK, DECEMBER, 1916

NEW SERIES
Vol. 14. No. 12

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS.
Published Monthly

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METALS AND MINERALS

The prevailing abnormal high prices of metals has had a wonderfully stimulating effect on mining conditions in the United States. Mines whose ores in normal times would not permit of profitable working have come to life again and are feverishly producing at fullest possible capacity in the hope of getting enough returns while the tide lasts before they have to subside again to idleness.

One of the greatest aids to the development of the mining industry in general and to the low grade propositions in particular is the adaptation of the Elmore flotation process. This process, it may be briefly stated, has for its foundation the fact that certain kinds of oil have the property of seeking out and separating particles of certain minerals, as, for instance, sulphide of zinc or copper, from the gangue rock in which they are found. The ore is ground to a certain fineness and is fed into vats containing oil and water. The mass is agitated and the bubbles or globules of oil attach themselves to particles of mineral and float to the top of the vat as a frothy scum. This scum is floated off from the top of the vat while the worthless gangue rock remains at the bottom. The Bureau of Mines has recently issued a pamphlet giving a bibliography of recent literature on the subject of flotation that is very complete, and should prove valuable to those interested in the mining of metals. This bibliography supplements one previously published and covers only abstracts of articles published during September, 1916. The fact that these articles as listed here cover sixty-one titles goes a long way to prove the enormous application of the flotation process at the present time.

To the zinc industry alone this means of separation has been a wonderful boon. Mines which have to be idle when spelter sells at its normal price of say five cents a pound can now be worked with spelter selling at 16 cents a pound and an enormous demand for it at that. Great piles of zinc bearing material that have not hitherto been given much attention are now being eagerly bought up and processes are being devised whereby the metal can be recovered and sold at a very large profit. The same conditions are true of lead, tin, antimony, and in fact any mineral deposits that are known of or can be discovered by feverish prospectors. Taking it all in all we do not believe there has been such activity in mining in general in the history of the United States. The newspapers show this by their large full page display advertisements of mining stock of all kinds which offer wonderful chances for getting rich quick. It would be well for intending investors to be fully advised of

just what the company, offering its stock at attractive prices, has to back up the stock issue. The published announcement that a certain mine is in the locality of some well-known and tried producer should not be sufficient. The new mine might be separated from the producer by a mountain or a river and still be in the locality!

It is not only the mines of the more prominent metals like silver, copper, zinc and lead that have experienced this revolution but other minerals as well. The reported operation of the Aluminum Company of America at Sparrows Point, Maryland, is a good example of this demand for production. We understand that at this new plant, which is said to involve an expenditure of $8,000,000 and to employ 3,000 men, bauxite of a low grade is to be refined for the production of alumina used for the manufacture of aluminum.

Another material that has perforce come to the attention of the metal industry is graphite. This mineral, as is well known, has never been produced in sufficient quantities and of the required purity for use in crucibles in the United States. This has been due mainly to labor conditions abroad and the bulk of the graphite used here for this purpose came from Ceylon, India. With the coming of the war England appropriated nearly all of it for her own uses and the United States went without. Immediately American mines were sought for and opened and now there are a large number being, at present high prices, profitably worked. Also the quality is being looked after and crucibles are being successfully made out of it.

Co-incident with the graphite problem is that of clay. Since the shutting off of Klingenburg clay from Germany there has been an earnest endeavor on the part of manufacturers in this country to investigate all the properties of American clay. From current reports it appears that some very excellent crucibles are now being made with American clay and the manufacturers promise still better results as time goes on.

THE METAL INDUSTRY INDEX

We publish in this issue of THE METAL INDUSTRY the complete index for the year of 1916. We believe that the mass of material relating to the metal industry that has been published during the year now drawing to a close and to which this index is the key, has not been excelled by any journal devoted to the metal trades. A glance at the list of titles as shown in the index will prove our assertion that there has hardly been a phase of the metal business that has not been covered in some way; either by a leading article, editorial, correspondence, shop problem, equipment notice or by a patent notice. The list of authors it will be seen contains the names of some of the best-known experts in their line. Men who have made good and whose ideas and opinions are viewed with respect by their readers. Study the index of THE METAL INDUSTRY for 1916, and you will see the standard that we will have to live up to for 1917, and which we have great hopes of raising still higher and this we really hope to do.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY.

CURE FOR NICKEL POISON

To the Editor of THE METAL INDUSTRY:

My plating room boys have tried the formula for a cure for nickel itch as recommended in your November issue, but so far the results have not been very satisfactory. While the solution seems to stop the spread of the sores yet they are not healed entirely and we would like it very much if you can suggest something that will completely cure and relieve us of this trouble. Going to the physician for a month or so without any good results is more expensive than our boys can stand.

CHARLES HEINES.

New York, N. Y.

We have read your report on the application of the remedies advised for the prevention and cure of nickel sores, commonly known as nickel itch, which some of your plating room employes suffer with severely. The mere fact that the application of the remedies have produced control of the sores proves that the remedy is effective, but you can hardly expect a cure in a week's time when some of your boys, as you state, have been going to the physician for a month or more without results.

We, however, are going to suggest another method which will no doubt prove effective in a short time. It is up to your company to provide this remedy and see that the applications are made, for this type of sore is very distressing and your employes could claim recompense for idleness during the period the sores were healing.

The method which we desire you to use is as follows: Procure some perborate of sodium and peroxide of zinc; both of these materials contain the aseptic properties of peroxide of hydrogen or dioxogen in their purest form. When using the materials, first wash the hands thoroughly in luke warm water, dry thoroughly and then immerse in a warm solution of perborate of sodium and water in the proportion of

Water	2 quarts
Perborate of sodium	¼ ounce

Immerse the hands in the solution for three to five minutes. Then dry thoroughly and each evening before retiring apply the peroxide of zinc in the form of an ointment. This ointment should be prepared as follows: Procure some lanolin or white vaseline and add a sufficient amount of peroxide of zinc to form a thick pasts or ointment. Rub this ointment into the sores. Continue these applications until the sores are entirely healed.

We would also suggest that your boys obtain peroxide of zinc soap and use it when washing their hands.

If the blood is kept cool by the aid of a quarter of a teaspoonful of rochelle salts in a tumbler of cold water it will help a great deal.

PLATING EDITOR.

A further reply has just been received from Mr. Heines.

To the Editor of THE METAL INDUSTRY:

We have been using your revised solution for nickel itch which contained the peroxide of zinc. We now have to report that the remedy is a fine thing and myself and boys, whose hands were affected, send you our best thanks.

We hope that you will print the information in THE METAL INDUSTRY for the benefit of other sufferers.

CHARLES HEINES.

New York, N. Y., November 20, 1916.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE.

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

ALLOYING

Q.—We have been asked to furnish an aluminum alloy that will be very light for aeroplane work and have a tensile strength of 23,000 pounds to the square inch with an elongation of upwards of 4 per cent. We would like to have you give us information as to aluminum alloys that will stand this strength test. You might give us several different ones, some with the addition of magnesium and any other appropriate ones you have on hand.

A.—Magnalium with 93 per cent. aluminum and 7 per cent. magnesium will meet the requirements you mention, but it is a rather difficult alloy to manage in the foundry. A large number of tests of this metal averaged as follows:

Tensile strength	27,000 lbs.
Elongation in 2 inches	3.3 per cent.

By lowering the magnesium a little, a greater elongation can be obtained.

Another mixture is aluminum 93 per cent., phosphor-copper 3½ per cent., magnesium 3½ per cent. Still another formula is aluminum 91 per cent., copper 5 per cent., tin 4 per cent.

Pure metals and infinite care in melting are necessary to obtain ductility in these alloys. If not carefully handled, they will have no more elongation than cast iron and their tensile strength will be less than 15,000 pounds.—J. L. J. Problem 2,376.

CASTING

Q.—Would you kindly inform me as to the method of casting soft metal filigree ornaments in dies. Also the necessary equipment.

A.—For casting filigree ornaments in soft metal a mold known as a one-piece mold is used and is prepared from a bronze composition; the filigree detail being in the mold while the back of the mold is made from asbestos or asbestos paper secured to a piece of hard wood.

The metals used are antimony and lead (85 per cent. lead and 15 per cent. antimony), solder metal (50 per cent. lead and 50 per cent. tin) and britannia metal (which is composed of various percentages of tin and copper).

The necessary equipment for this work would be as follows:—molds, iron ladles, iron screw clamp brackets for holding the mold in position while casting, melting furnace which may be heated either by gas or coal. A five gallon type furnace would answer your purpose.—C. H. P. Problem 2,377.

DIPPING

Q.—Our acid dipping room is in a cellar and the acid fumes are bothering us. Where the dipping is done there is a chimney, but it has not sufficient draft to take away the fumes. If we put an exhaust in the chimney we are afraid that the fumes will eat it away in a short time.

A.—If the chimney is of brick then you need not fear the results you surmise, but as an extra precaution coat the inside of the chimney with coal tar or a boiling coal tar asphaltum, such as is used for roofing purposes.—C. H. P. Problem 2,378.

FINISHING

Q.—Can you inform us how to plate aluminum with nickel or copper?

A.—The latest practice in nickel or copper plating aluminum is as follows: The articles are cleansed in the usual manner by removing polishing dirt by the aid of gasoline or benzine; then by the aid of warm potash or soda solutions. As a pickle instead of a cyanide dip use very dilute solutions of hydrofluoric or hydrochloric acid, about 2 to 4 ounces of either in each gallon of water will be ample.

After the cleansing operations the articles should be immersed in a solution consisting of 4 to 8 ounces of chloride of iron to each gallon of water and from ½ to 1 ounce of hydrochloric acid added as free acid. This immersion in a few minutes produces a film of iron which protects the aluminum surface which after washing in water, may be plated direct in the usual nickel or copper solutions. A strong current should be used at first in order to cover the articles completely with metal. Better results are obtained when the nickel or copper solutions are heated to 100 degs. Fahr.—C. H. P. Problem 2,379.

Q.—I require a formula for obtaining a United States Government bronze finish on brass goods.

A.—There are several United States government bronze finishes; one is a dark gun-metal finish used by the navy on lighting fixtures, and termed navy bronze. The other, which is more widely known, is termed the army bronze, and is of a deep brown tone, but to produce a successful finish of this nature the articles must be copper plated first.

We give below the formulas for both finishes:

NAVY BRONZE.

Muriatic acid	1 gallon
White arsenic	1 pound
Single nickel salts	2 ounces
Sulphate of copper	½ ounce
Water	1 pint

Dissolve the arsenic in the acid by the aid of heat. Dissolve the nickel and copper salts in the water (warm) and mix. Use the solution cold as a regular electro-plating solution with nickel anodes, and at about 2 volts. All brass work should be nickel-plated for a minute or so; otherwise the bronze solution, being acid, will react upon the brass.

ARMY BRONZE.

Sulphate of copper	1½ pounds
Single nickel salts	2 ounces
Water	1 gallon

Heat to the boiling point and immerse the brass goods, which have been previously copper plated, in the solution until a deep brown tone is produced. Then scratch brush lightly, re-immerse for a second or two, then remove and lacquer.

The navy bronze should also be lacquered to protect the finish. Yellow sulphuret of antimony dissolved in ammonia and heated to 180 degrees, also gives a military bronze finish.—C. H. P. Problem 2,380.

MIXING

Q.—Will you kindly furnish me with the formula or mixture that is used by valve manufacturers in high-grade valves of 250 to 300 pounds pressure? Also advise the mixture used in standard valves of 125 pounds pressure.

A.—The following is a formula for a mixture for high-grade valves:

Copper	85 pounds
Zinc	7 "
Tin	3 "
Lead	5 "

For standard valves of 125 pounds pressure we would suggest the following:

Copper	76 pounds
Zinc	18 "
Tin	3 "
Lead	3 "

—J. L. J. Problem 2,381.

OXIDIZING

Q.—Kindly publish a formula for a blue oxidize on copper.

A.—The following formula will give you a blue color upon copper:

Water	1 gallon
Sodium hyposulphite	8 ounces
Lead acetate or nitrate of iron	1 to 2 ounces

Cleanse the articles as usual and immerse in the above solution for a few seconds. The temperature of the solution should be 180 degrees. The final color will be a bluish gray, but this solution is used extensively in preference to the liver of sulphur dip, which produces a darker tone.—C. H. P. Problem 2,382.

PLATING

Q.—We are having trouble in nickel plating iron castings which we believe is due to the amount of acid remaining on the castings from the nickel solution and which affects the copper plating solution. Would you kindly advise the best way to treat iron castings, from the time they leave the foundry until they enter the solution, that are to be nickel plated, and also kindly advise the best copper solution for plating iron castings?

A.—If the iron castings contain any sand, that is burned in sand, then they should be manipulated as follows:

First—Pickle in a 20 per cent. solution of hydrofluoric acid (20 per cent. acid and 80 per cent. water) for 15 to 20 minutes. The acid will loosen the sand. Second—Wash in cold and boiling water. Third—Tumble in water to which is added about 2 ounces of soda ash per gallon of water. Tumble from 15 to 30 minutes, according to the finish required upon the castings, or longer if smooth castings are required. Fourth—Wash well in clean water after tumbling, immerse in a muriatic acid dip (25 per cent. acid and 75 per cent. water), rewash and plate.

One of the best formulas for copper plating cast iron consists of the following proportions:

Water	1 gallon
Sodium cyanide	4½ ounces
Copper cyanide	4 ounces
Soda ash	2 ounces
Hyposulphite of soda	⅓ ounce

If possible use the solution at a temperature of 100 to 110 degrees at 4 volts.—C. H. P. Problem 2,383.

Q.—Could you tell me what causes a black settling to form when taking up copper cyanide with potassium cyanide. Also, is it wise to put it into the vat with the clear solution? It is dissolved by adding the copper cyanide to some warm water, and then adding the potassium cyanide until the solution turns brown.

A.—The black settling noted when dissolving copper cyanide is presumably due to iron which is contained in the wash waters used in the preparation of copper cyanide. This sediment is in no way injurious to the solution and apparently goes into solution under electrolysis or during the plating operation. If you wish to avoid the sediment when replenishing your solution, then prepare a wooden frame made up from ⅞ x 2 inch pine about 24 inches square. On this frame secure three or four thickness of cheese cloth so it sags somewhat in the center. By passing the solution through this strainer the sediment will be separated from the solution leaving it sufficiently clear.

The best method of dissolving copper cyanide is to use sodium cyanide. If an excess of cyanide is to be avoided, then for every ounce of copper use ⅞ ounce of sodium cyanide. Dissolve the cyanide in water at a temperature of 100 degress, then add the copper cyanide until all dissolved. You can afterwards add from ⅛ to ⅜ ounce of sodium cyanide per ounce of copper cyanide as free cyanide, if necessary, which can be determined by the anodes. To produce the most effective results from copper cyanide in solution occasionally add about 2 pounds of soda ash per 100 gallons of solution and 2 to 4 ounces of hyposulphite of soda, once a week or every two weeks will be sufficient.—C. H. P. Problem 2,384.

RECOVERING

Q.—Having read in THE METAL INDUSTRY of the usefulness of copper from the solutions of sulphate of copper which are obtained during the process of cleaning brass, we would be obliged if you would give us an idea of the installation, force, voltage of dynamo and class of electrodes, etc.

A.—The apparatus necessary to recover the copper from waste pickle solutions by electrolysis includes lead lined tanks, the number and size of which depend upon the amount of solution intended to be treated. Usually four tanks holding upwards of a thousand gallons each are sufficient. Then a small pump is necessary which keeps the solution in circulation and the dynamo required should have a capacity of at least ten volts and around a thousand amperes. Electrodes are; sheets of lead for anodes and thin sheets of copper for cathodes.—K. Problem 2,385.

HOT ROLLING

Q.—We are hot-rolling 60/40 metal for brass fuse rods, and lately, in order to make a freer turning metal, we added lead to the castings to bring the percentage up to 1.5 per cent. lead. The rods from this metal cracked badly when broken down from the billet. As there is a diversity of opinion as to whether this defect is caused through the high lead contents, we should be much obliged if you would give us your opinion on the subject. We may say that with the lead contents below 1 per cent. we have no trouble at all.

A.—There is no doubt that the cracking of the rods is due to the increased lead content. With 1 per cent. lead you would, of course, experience less difficulty, but care would be necessary to ensure the copper contents being kept well down to 60 per cent. Any increase above 60 per cent. would be liable to cause cracking. Similarly a decrease in copper contents will enable you to introduce more lead, probably up to 2 per cent. Try cutting your copper down to 58 per cent. or 58.5 per cent. and you will experience less difficulty with cracking of rods, even with 1.5 per cent. lead. You will also find that rods of this composition are softer to roll hot, but care should be taken not to overheat at the metal.

The reason for this difference in behaviour towards lead lies in the greater proportion of the beta constituent present in the alloys containing less copper. This beta constituent apparently holds the lead in solid solution, or at any rate, checks its propensity for causing "hot-shortness."—W. T. F. Problem 2,386.

STERILIZING

Q.—Please give me a little information on sterilizing water. I have tried using a wooden vat, but found it was not the proper thing to use, as it leaves the scum sticking to the sides.

A.—It all depends upon how much water to be sterilized at one time. Wooden vats are of no use whatever. The following method may help. Procure a five-gallon spring water bottle, such as is used in offices to hold the spring water. Fill the bottle with as pure water as possible, then place some absorbent cotton packed loosely in the neck of the bottle. Then place the water bottle in a tank of water, that can be raised to the boiling point with steam coils or other methods of heating. Keep the bottle containing the water to be sterilized immersed at least thirty minutes after the water in the tank has reached the boiling point.—C. H. P. Problem 2,387.

TUMBLING

Q.—Is there a better way of tumbling brass plated hardware than with soap bark or bi-carbonate of soda to give them a bright finish after plating?

A.—Soap chips and borax make a good tumbling medium for brass plated goods. Many platers also use the old fashion black platers' compound commonly termed whale oil soap. About 1 to 2 ounces per gallon of water proves effective as a tumbling medium.

Dry tumbling is also being employed by some platers and they are having excellent results. The work is put in the tumbling barrel dry with the regular steel balls. This method gives the articles a better lustre than the wet method.—C. H. P. Problem 2,388.

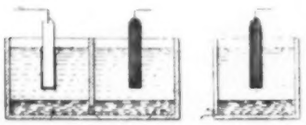
PATENTS

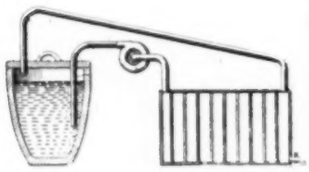
A REVIEW OF CURRENT PATENTS OF INTEREST.

1,200,025. October 3, 1916. **Process of Recovering Metals.** C. J. Reed, Glenside, Penn.

The patent covers:

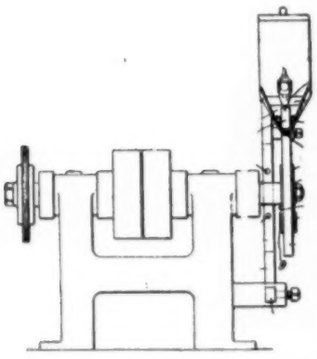
1. The process of recovering metals, as shown in cut, which are electropositive to mercury from an aqueous solution, which consists in electro-depositing the metals in a cathode of mercury, dissolving said metal from the resulting amalgam and simultaneously depositing it upon a cathode with which it does not alloy or amalgamate, and compensating the solution of metal by local action from the amalgam anode by supplying thereto the requisite additional quantities of amalgam.





2. The process of recovering zinc from its aqueous solutions, which consists in electro-depositing the metal in a cathode of mercury, dissolving the zinc from the resulting amalgam and simultaneously depositing it on a cathode with which it does not alloy or amalgamate, and compensating the solution of metal by local action from the amalgam anode by supplying thereto the requisite additional quantities of amalgam.

1,200,624. October 10, 1916. **Buffing Machine.** Albert L. Kraus, of Peabody, Massachusetts, assignor to Albert L. Kraus, of Peabody, Massachusetts, and Edward L. Millett, of Beverly, Massachusetts, co-partners doing business under the firm-name and style of Kraus Millett & Company, of Peabody, Massachusetts.



This invention relates to buffing machines, and more particularly to the wheels of such machines of the type which carry a removable buffing strip, as shown in cut. In the wheels of this type heretofore provided, it is necessary to remove a part or parts of the wheel in order to take off the worn-out strip and to replace such part or parts after the new strip has been placed in position. This work of changing or renewing the buffing strip is often laborious, consuming considerable time, and it is one of the objects of this invention to provide a wheel wherein the buffing strip can be readily removed and replaced without removal or replacement of any part or parts of the wheel.

A further object of my invention is to provide means for moistening the buffing strip with a solvent of the finish of the article being operated upon and maintaining the strip in a moistened condition during the operation of the machine, thereby lessening or preventing damage to the finish of the article by reason of the abrasive character of the buffing material.

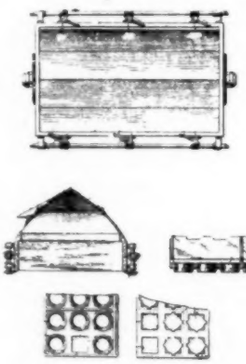
1,203,180. October 31, 1916. **Metal Alloy.** Theodore B. Brix, of Newark, N. J., assignor, by mesne assignments, to American Alloys Company, of Newark, N. J., a corporation of New Jersey.

The alloy, which is the subject matter of this invention, has several highly valuable characteristics, and in its preferred form it may be designated as a nickel-chrome alloy, since the nickel-chrome content predominates.

The preferred form of the alloy contains nickel, chromium, copper, silicon, tungsten, aluminum and manganese (the aluminum appearing as a result of the manufacture of the alloy, as aluminum facilitates the manufacture, but it is mostly burned out and may be replaced by copper in producing or manufacturing even the preferred form of alloy, although for some uses of the alloy the presence of aluminum in the alloy may prove to give to it certain desirable features). This form of the alloy is made by reducing to a molten mass the following metals in the approximate proportions set forth: Nickel, 60 to 75 per cent. by weight; chromium, 15 to 20 per cent. by weight; copper, 5 per cent. by weight; silicon, 4 per cent. by weight; tungsten, 1 to 4 per cent. by weight; aluminum, 2 per cent. by weight; manganese-titanium (⅔ manganese), 3 per cent. by weight, or manganese, 2 per cent. by weight, and boron 1 per cent. by weight.

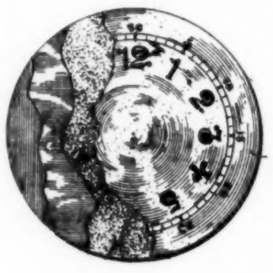
1,202,262. October 24, 1916. **Apparatus for Corroding and Drawing Lead.** E. C. Bersch, Chicago, Ill.

The main objects of this invention are to provide separate receptacles, as shown in cut, for the lead and the corroding acid, to prevent the lead from accidentally dropping into the acid and thereby becoming moistened and making difficult the further treatment of the lead; and also to permit separate handling of the lead and acid receptacles; to provide means permitting improved ventilation in corroding stacks whereby corrosion may take place uniformly throughout the stacks, and the lead will therefore not be discolored, due to the formation of red lead, which makes necessary the separation of the red lead from the white lead; to provide an improved construction of corroding pots whereby they may be removably secured to supporting trays, and these trays may be handled mechanically in forming or stripping the corroding stacks, and thereby make unnecessary manual handling of corroding pots.



1,202,625. October 24, 1916. **Luminous Composition.** C. H. Vohl, Pittsburgh, Pa., assignor to Standard Chemical Company, of the same place.

This invention relates to improvements in luminous articles of manufacture, and more particularly to means for rendering objects luminous in the dark—the object of the invention being to provide a luminous composition in which the light giving ingredients shall be incorporated therein in such manner that they shall constitute a fixed part of the composition, and to so apply the material to an object that it will form in effect an integral part thereof, and prevent possibility of the escape or displacing of said light giving or phosphorescent ingredients. With these



and other objects in view, the invention consists in certain novel combinations of ingredients, as shown in cut.

In applying the composition to the object to be rendered luminous, a preliminary coating of a vitreous glaze (which may be white or transparent) is applied to the object, and after firing this glaze there is placed upon the surface a mixture of a suitable phosphorescent compound, such as zinc sulphide containing radium salt—such luminous material being mixed with a proper proportion of a suitable vitreous glazing material, which shall be such that when then fired, the luminous material becomes incorporated in the glaze. Over this, a finishing coat of phosphorescent glaze is then fired, and upon this suitable figures and characters may be imprinted if desired to form, for example, watch or other indicating dials.

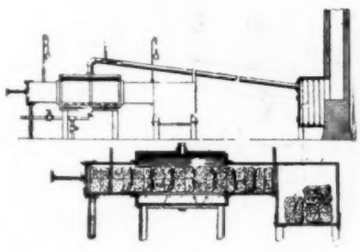
1,202,278. October 24, 1916. **Apparatus for Disentegrating Ores and Other Materials.** Arthur Faust, New York, N. Y.

This invention relates to apparatus for disintegrating ores and other materials. In the apparatus hitherto devised for the purpose, a tumbling barrel was used which was rotatable about an axis arranged in a general horizontal direction, and capable of being tilted to various degrees of inclination to the horizontal. This barrel was provided with an inlet opening of suitable character, through which the material to be treated was introduced, and with an outlet opening at the axis of the barrel, through which the ground or disintegrated material was discharged. In the devices hitherto used, it was considered essential that the shape or form of the barrel, backward from the outlet opening, was that of a cone, and that the said outlet opening be at the apex thereof.

This invention consists in having the inner surface curved so as to cause an efficient triturating action, and it has certain definite advantages over the prior forms described, and the invention is shown in the accompanying drawing.

1,202,886. October 31, 1916. **Detinning Tin Scrap.** W. T. Phelps, Baltimore, Md., assignor to Phelps Can Company, Weirton, W. Va.

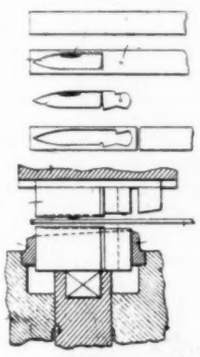
This invention has reference to improvements in detinning tin scrap, and while intended more particularly for removing the tin coating from the basic material, iron or steel, it may be employed for removing lead or zinc from like scrap, for which reason the word tin as hereinafter employed throughout the specification is to be understood as including other metals of similar character.



By the present invention the tin scrap is introduced into a furnace chamber or other suitable inclosure, as shown in cut, protecting against free access of the atmosphere, and in such inclosure the tin scrap is subjected to a heat sufficient to cause the tin to oxidize and volatilize, such heat being that at which iron is at a low red, usually known as about cherry red. The heating is carried on in the presence of a minimum amount of air so as to prevent oxidization of the steel. The fumes are carried from the heating zone into a flue where air may be admitted to insure oxidation of all of the tin, and from thence the fumes are caused to travel for a suitable distance to cause the fumes to cool sufficiently so that the tin oxide may be collected in any of a variety of ways, one simple way being to pass the condensed matters which are then in the form of tin oxide dust, through fine fabric. This collects the tin oxide while the cool products of combustion may pass to a suitable flue or other means of creating the draft through the structure. The products of combustion may still be sensibly hot for the term cool is used only relatively, meaning that the temperature of the gases has dropped sufficient to permit the condensation of the volatilized tin or tin oxide.

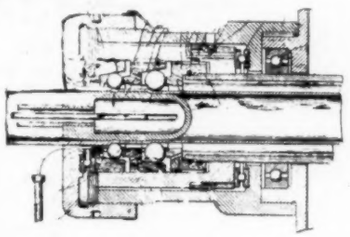
1,202,611. October 24, 1916. **Apparatus for Making Metal Articles.** Herbert Tolputt, Sheffield, England.

According to the present invention metal blanks or the like for cutlery articles, tools and other instruments or purposes direct are formed from a sheet or strip of metal such as steel by the following method and means, as shown in cut: There are employed two dies, one or both of which is adapted to approach toward and recede from the other in any suitable manner (advantageously in a straight line) and operated by any suitable means; and the contour of said dies corresponds with the contour of the finished article (blank) as, for example, in the case of a blade for pocket knives, each die would have a contour corresponding to the contour of the finished blade and tang; and each such die is recessed or sunk or so formed on the operative surface thereof as to correspond with the shape of the side face of the blade and tang, and each such recess or sink of a suitable depth, for example equal to, say, half the thickness of the blade or other article, so that when the two dies are brought together or nearly together (i. e., in the operative position), the cavity or mold formed between same by said respective recesses thus corresponds with the shape in all respects of the knife blade or other articles to be made.



1,203,306. October 31, 1916. **Apparatus for Drawing Metal.** L. H. Brinkman, Glen Ridge, N. J., assignor to Ball Rolled Tube Corporation, of New York.

This invention relates to apparatus for drawing metal. One of the objects of the invention is to provide a durable and efficient die for this purpose.



The invention in its preferred embodiment, as shown in cut, is especially useful for drawing hot metal, and more particularly for drawing hot tubes, although it will be obvious to those skilled in the art, after understanding the invention, that certain of its features are useful in drawing cold rods or tubes.

Another object of the invention is to provide for cooling the die parts when drawing hot metal by using fluid forced through the die parts or by the aid of centrifugal force, and in the preferred embodiment of the invention using die balls, to cool the die balls by direct contact of the fluid and wash out the scale from the raceway in such manner that the fluid is conveyed off without coming in contact with the hot metal to chill it, and thus interfere with the drawing operation.

1,203,991. November 7, 1916. **Alloy.** J. T. Dwyer, St. Louis, Mo.

This invention relates to an alloy more particularly intended for use in the production of type, the invention having for its object to produce a type metal at less cost than the type metal heretofore in use, and one which is denser and will flow more freely than the usual type metals.

The patent covers:

An alloy composed of the following ingredients mixed in approximately the proportions specified: 12 per cent. antimony, two hundredths of one per cent. phosphorus and 88 per cent. lead.

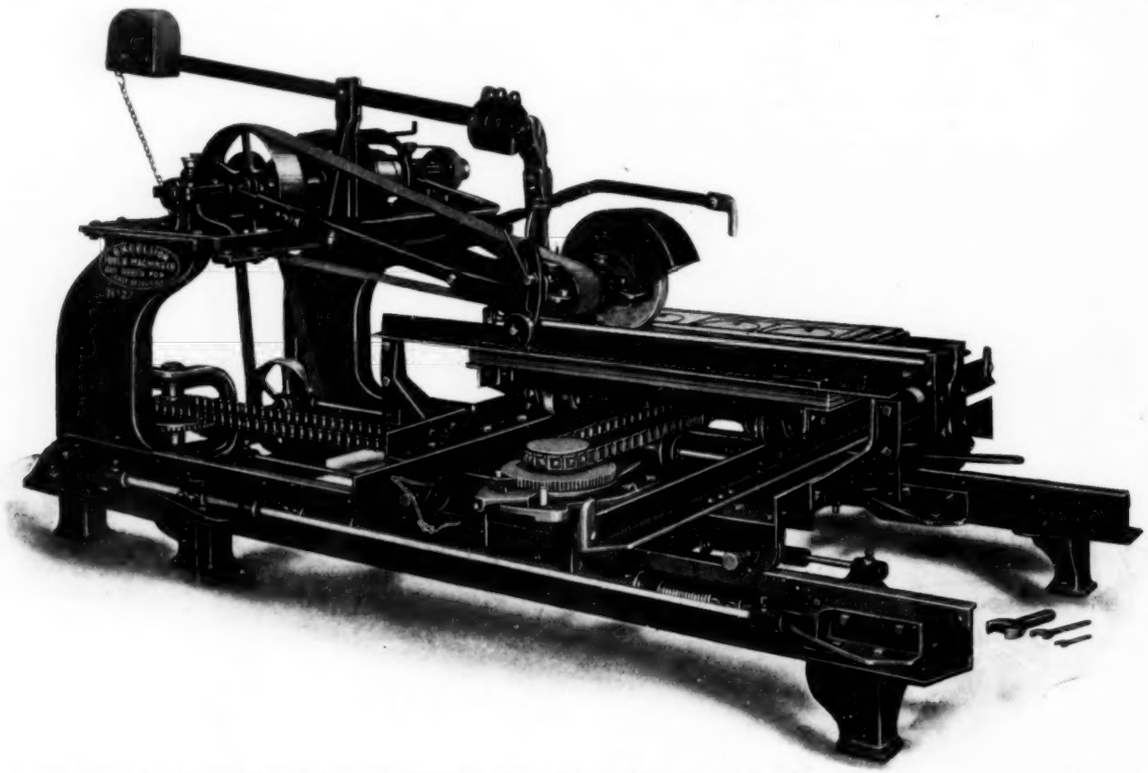
1,203,802. November 7, 1916. **Apparatus for Etching Plates in the Photo Engraving Process.** J. J. C. Smith, Passaic, N. J.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST.

POLISHING MACHINE

A machine which attracted considerable attention at the Cleveland Convention of Foundrymen, in September, 1916, was the polishing machine shown by the Excelsior Tool and Machine Company, East St. Louis, Ill. This machine is an improved pattern of the one shown at previous exhibitions and is so constructed that a pipe polishing attachment can be put on it and tubes and rods may be polished with the same facility as are flat and curved surfaces. The manufacturers state that the material used in the machine is of the very best, consisting of structural and cast steel and cast iron adjustments firmly riveted and bolted together.



THE METAL POLISHING MACHINE. MADE BY EXCELSIOR TOOL AND MACHINE COMPANY, EAST ST. LOUIS, ILL.

The main swing frame has roller bearing connections allowing a free and easy movement over the work to be polished. Belt tightening adjustments are provided, preventing re-lacing of the belt when slipping. The pressure on the grinding wheel should be from twenty to twenty-five pounds; this is regulated by the slotted weights on the balancing bar as shown. All grinding wheels should be balanced and run true to avoid vibration, and should be as near the same diameter as possible. 12 x 2 inches 60 grain, O. grade solid emery wheel is mostly used for roughing out castings and pipe. Adjust the dust hood low enough to catch the dust without touching the castings.

The pipe polishing attachment can be adjusted or removed within twenty minutes, and consists of two angle iron supports, one fastened to the truck to which are clamped the head and tail stock, which are adjusted to receive any size and length of ½ or ¾ or 1-inch pipe from 6 to 60 inches long, with or without threads. The two rest brackets hold the pipe in line with the centres, to quickly remove or insert the pipe. The lower two clamp brackets are set to release the feed at each end of the pipe. After these attachments are set for a certain length of pipe and the feed started in either direction, the feed is stopped and the wheel raised automatically.

NEW ENAMELING PLANT

By A. D. Fisher, Commercial Manager.

The Adams-Bagnall Electric Company of Cleveland, Ohio, is now completing an addition to their factory with the installation of a complete vitreous or porcelain enameling plant. The primary object of this addition is to further improve the quality and service of the well-known Abolite line of porcelain enameled reflectors for industrial lighting, the porcelain enameled reflectors used in the AB pendant fixtures for street lighting and AB enclosed arc lamps; as well as some parts used in the manufacture by this company of transformers, electric fans and auto electrical accessory equipment.

The high grade of the porcelain enamel finish has always been an important feature of Abolite reflectors. With its own enameling plant, The Adams-Bagnall Electric Company will be in a position to strengthen this characteristic through personal factory supervision. The steadily increasing demand for Abolites as well as faith in the maintenance of this growth has led the company to make this investment in order to ensure increased production facilities and elimination of the extra hauling and handling that is the general practice in the manufacture of enameled steel reflectors. It is understood that this company will be the only manufacturer of electrical apparatus manufacturing porcelain-enameled, steel reflectors complete in their own factory.

The enameling plant is being equipped for all classes of high grade vitreous enameling. A battery of four 12-foot furnaces will be supplemented with complete equipment of mixing vats, Smalt furnaces, drying ovens and handling apparatus capable of producing a large output. The operation is in charge of men with thorough experience in vitreous porcelain enameling. The equipment is new and of the latest design to secure uniform results. As the complete outfit is new, it has been possible to make a practical layout that permits most ready handling of the enameled products.

In addition to enameling all Abolites and associate equipment, the Adams-Bagnall plant will be capable of handling a considerable output of other vitreous enameling work. The plant will be in full operation before January 1, 1917.

OXY-ACETYLENE BLOW PIPE

The Prest-O-Lite Company, of Indianapolis, Ind., had an interesting exhibit of their line of Type G welding apparatus at the convention of foundrymen held in Cleveland, Ohio, in September, 1916. Among these was a small oxy-acetylene blow pipe for light work. This Type G blow pipe, shown in the cut, is said, by the company, to be extensively employed by manufacturers of automobile bodies, aeroplane frames and body works and is also used for brazing on light work and is employed with much success in lead burning. It is claimed that on account of the small gas consumption, lightness and ease of manipulation that this type of welding blow pipe is ideal for a great many light manufacturing operations where speed and economy are essential.

PREST-O-LITE TYPE G WELDING APPARATUS.

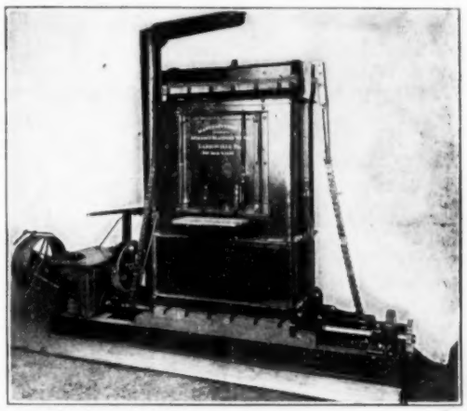
PREST-O-LITE TYPE G BLOW PIPE.

Approximate oxygen and acetylene consumptions for the various Type G tips are shown in the following table:

Tip	Acetylene	Oxygen
G—00	½ foot	½ foot
G—0	1 foot	1 foot
G—1	2 foot	2 foot
G—2	3 to 5 foot	3 to 5½ foot
G—3	6 to 9 foot	6 to 10 foot

THE MINNICH METAL BALING PRESS

The press shown in the cut has been designed by the manufacturers to operate on entirely new principles from that formerly in use. Both sides and ends of the press open out, leaving the bale of metal clear and easy to remove. One catch only is needed to operate in opening and closing. The machine presses downward thus obviating the need of raising the bales, bars, followers, etc. This leaves the bale more convenient to sew and hoop, and it is eighteen inches from the floor when finished, just the right height for turning on a truck or setting on end without dropping and jarring the building. Extra large bales may be made by twice pressing, no time being lost by returning the follower. All sizes of bales can be made and all bales equally tight.

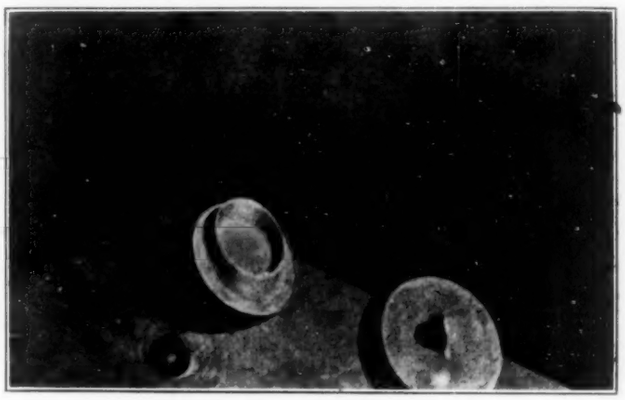


MINNICH BALING PRESS MADE BY MINNICH MACHINE WORKS, LANDISVILLE, PA.

One of the special features of this press, as stated by the manufacturer, is the fact that the press may be used in low ceiling buildings and no cutting of floors is necessary and there is no pressure on the floor. The press can also be mounted on wheels and run forth and back through the building on tracks or over floor from bin to bin. This press is made in a number of sizes; the average size for scrap metal baling is 24 by 18 by 36 inches deep, inside dimensions. The manufacturers sell these presses with the guarantee to turn out more bales with less power and labor than any other press on the market or there is no sale. The press is manufactured by the Minnich Machine Works, Landisville, Pa., who will be glad to send a catalog on request.

AN IMPROVED BLAST GATE

One of the minor problems of the average polishing room is that of keeping the pipes of the exhaust system closed when some of the wheels are not in operation. When many pipes not in use are left open, a considerable amount of power is wasted.



AN IMPROVED BLAST GATE.

When the hoods are of the ordinary removable type for jewelry bench lathes, the pipe is run up through the bench top at an angle of 45° and brought flush with the upper surface. The

hood then sets on the bench with a short collar, perhaps 2 inches long, extending into the branch pipe. In the ordinary installation where blast gates or dampers are provided, these are placed in the pipe below the bench. Being out of sight, it is easy to forget to close them, and it usually happens that when the exhaust system is a few weeks' old most of the blast gate slides are lost.

To provide a blast gate that is easily closed and hard to forget, a prominent New England manufacturer devised an ingenious cast-iron plug or cap which fits snugly over the top of the pipe when the hood is removed. In this plant, it is the rule to remove the hood, leaving the bench clear when leaving the job for more than a few minutes. The ½-inch collar of the plug, bevelled to fit the 45° opening, is slipped into the pipe with its top fitting closely against the bench. A convenient handle is provided, as shown in the photograph. The cost of the pattern and castings for 85 openings was quite a little less than that of the ordinary slide gates.

IDEAL STYLE "A" RELEASING TAP AND DIE HOLDER

This device is a combination holder adapted for either taps or dies and is designed for use on either hand or automatic screw machines. The mechanism is entirely enclosed, eliminating any possibility of chips or dirt getting in and interfering with its operation. All of the parts are hardened giving it extremely long life. The shank is heavy with only a small hole through it eliminating possibility of getting out of round should the turret clamp screw be drawn down too tight. This holder can not wear so as to get out of alignment.

IDEAL STYLE "A" RELEASE TAP AND DIE HOLDER.

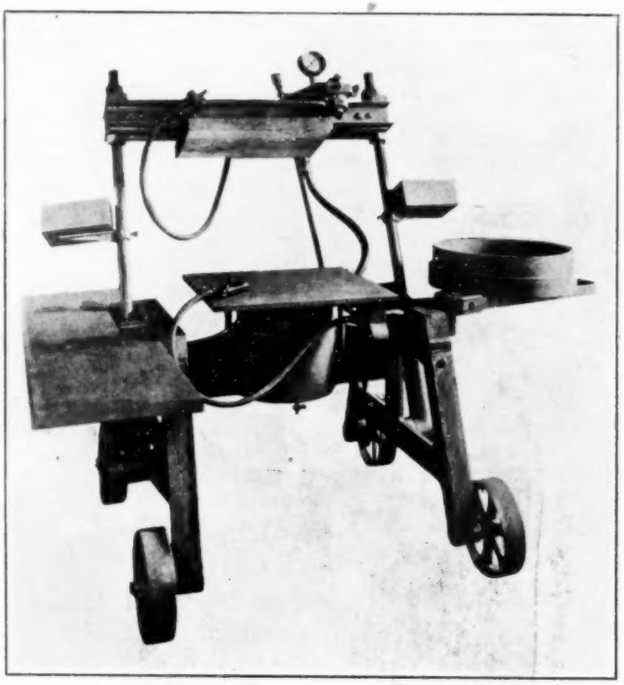
It will be noted from the cut that the drive forward is positive by means of two round pins (No. 7), driven into the bottom of main body. These pins engage with a square driver (No. 4), but as soon as turret comes up against the stop the die comes on just enough farther to release the square driver from the round driving pins, and the die will then spin around free until the machine is reversed. An adjusting screw (No. 8), has been provided for changing the length the die must travel after turret stops making it very desirable for short or fine threads or for going up close to a shoulder. A washer (No. 5), backed up by two springs (No. 6), holds the square driver in position. When the holder is released these springs allow the square driver to pass over the round ends of the pins almost noiselessly and eliminating practically all wear which naturally results if the square driver was held positive.

In designing this tool provision is made for using standard size dies. It can, however, be furnished to order so as to use special dies. The die is placed in holder flush and is held in place with headless set screws. When using taps a bushing is inserted in place of the die. This bushing is split so as to clamp the tap when set screws are tightened up. A particular feature of the tap bushing is that the tap is held by both the square and the round. This method insures of the tap being absolutely central every time.

The Ideal Brass Works, Indianapolis, Ind., make these tools regularly in four sizes ranging from ⅝ rd. diameter to 1½ inch diameter. Size of shanks for hole in turrets 11/16 to 1¼ inches in diameter. Special sizes to order. Prices range from $6 to $18.

MODEL D TYPE POWER SQUEEZER

The machine shown in the cut was designed by the makers, J. F. Webb Manufacturing & Supply Company, manufacturers of molding machines, Davenport, Iowa, with the object in view of reducing the weight of the power squeezer as much as possible consistent with a good strong machine. Special attention is directed by the manufacturers to the operating valve which is guaranteed to be air-tight. There is also an automatic valve



THE MODEL D POWER SQUEEZER MADE BY J. F. WEBB MANUFACTURING COMPANY, DAVENPORT, IOWA.

attached to the machine which will shut off the pressure at any desired point and it can be set to furnish any desired pressure. An air gauge attached to the machine is used to set the automative valve. The wheels with which the machine is fitted are ball bearing, making it comparatively easy to move the apparatus around the foundry.

A CRUCIBLE PRESERVER AND A NEW FLUX

The Hanson & Van Winkle Company, 269-271 Oliver street, Newark, N. J., announce that they have succeeded in greatly prolonging the life of crucibles by the use of their Graphite Liquid Preparation. They state that in one plant with 11 crucible furnaces running three heats daily, only one crucible flaked slightly, and that in the first heat. The 11 crucibles averaged when last heard from 32 heats, and were still running.

By using Graphite Liquid Preparation according to directions, and exercising the usual precautions in annealing, the company claims that crucible troubles can be largely avoided. The Hanson & Van Winkle Company are also putting on the market a non-metallic flux for foundry use, which can be used when melting brass or composition, pure aluminum, aluminum and zinc mixtures, German silver, nickel, etc. They also furnish a special mixture for galvanizing, solder, stereotype, linotype metal or white metal.

The use of the H. & V. W. non-metallic flux will, it is claimed, assure added strength and elongation, produce sound castings free from porousness, reduce oxidation to a minimum, lessen the amount of skimmings, lower the melting point, and prevent slag and metal from cleaving to the inside of the crucible.

The value of these properties will be at once apparent to foundrymen when it is realized how much the amount of metal lost in the fire can be reduced.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS.

AMERICAN ELECTRO-PLATERS SOCIETY

(AN EDUCATIONAL SOCIETY.)

President, H. H. Williams, St. Louis, Mo.; Secretary-Treasurer, Walter Fraine, 507 Grand Ave., Dayton, Ohio. All Correspondence should be addressed to the Secretary. The objects of this society are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. The Society meets in convention in the spring of each year, subject to the decision of the executive committee. The next convention will be held at St. Louis in June or July, 1917. The branch associations hold monthly and semi-monthly meetings in their various cities.

New York Branch—William Fischer, secretary, 300 St. Anns avenue, New York, N. Y.

Chairman Wm. J. Schneider of the banquet committee has issued the following notice:

"The annual banquet of this society will be held on February 17, 1917, at 8 p. m., at the Broadway Central Hotel, Broadway near Fourth street, New York City.

"Manufacturers are cordially invited to attend this banquet with their managers, superintendents, foreman platers and chemists.

"An especially attractive program has been arranged for, and it will be of sufficient interest to you. Well known speakers have consented to give addresses on various subjects of electroplating from both the scientific and practical standpoints.

"Space has been reserved at the above hotel for those of the manufacturers and dealers in platers' supplies and equipment, who may wish to exhibit their products at a small fee of $10 to help defray expenses.

"It is earnestly desired that a large number take advantage of this opportunity, and will send in application for space, and thus insure reservation of sufficient space."

Tickets for this banquet will be $2 each, which can be secured from any member of the local branch of the American Electro Platers' Society, as well as from the secretary, William Fischer, 300 St. Anns avenue, New York City.

All inquiries can be addressed to Wm. J. Schneider, chairman of the banquet committee, in care of the Broadway Central Hotel, New York.

Cleveland Branch—William D. Scott, 4110 Denison avenue, Cleveland, Ohio, has become secretary-treasurer of this branch to take the place of Charles O. Werft, former secretary-treasurer.

Cincinnati Branch—Frank H. Nordman, 720 Froome avenue, Cincinnati, Ohio, secretary.

This branch meets the first and third Friday of each month at 218 East Second street, Cincinnati, Ohio.

Milwaukee Branch—Ernest C. Yaeger, 962 Ninth street, Milwaukee, Wis., secretary.

This branch has decided to change the regular meeting time from the first Friday of the month to the first Tuesday, but the meeting place of the branch will be at the West Side Bank Building, Third and Chestnut streets, that city.

Philadelphia Branch—Philip Uhl, 2432 North 29th street, Philadelphia, Pa.

The November meeting was held at the Harrison Building, University of Pennsylvania, at which time the question as to the best method of nickeling tin was discussed and Dr. Lukens demonstrated with iodide of mercury how the crystals separated in the tin.

St. Louis Branch—F. C. Rushton, secretary, 4405 Blair avenue, St. Louis, Mo.

This branch held a lively meeting November 19, at which a large number were present. Plans were discussed for the annual banquet to be held in January, and the following were appointed as a committee on the arrangements. Messrs. Musick, Sampkemeyer and Dubelbeis. The members then took up the question of the annual convention, which will be held in St. Louis next June or July, and some committees were appointed. The topics of the evening were: "A Suitable Covering for Plating Racks" and "The Advantages of Magnesium Sulphate in a Nickel Solution."

NATIONAL ASS'N, BRASS MANUFACTURERS

The thirtieth annual meeting of the National Association of Brass Manufacturers will be held at the Hotel Astor on Wednesday and Thursday, December 13 and 14, 1916. The unusual trade conditions that exist at the present time with price of metals and copper, in particular, climbing like a thermometer on a warm day, will tend to make this meeting one of the most interesting and important in the history of the three decades of this organization, and it should be the magnet that will cause every member to attend, and which all brass manufacturers, whether members or not, are cordially invited to attend and confer with their fellow manufacturers as to the wise course to pursue in view of the erratic conditions existing at this time.

Manufacturers are now confronted with stock orders placed by the jobbers who themselves are quite solicitous and eager to be covered for their demands for the coming year and with the very sudden and rigid changes in the copper market, it places the manufacturer in a most unenviable position of having to contract for his wants to cover such contracts as he may make, and if still further advances follow, which seem imminent from present reports, he is placing himself in the position of losing an added profit he might get by not binding himself with these contracts. He is also assuming the further responsibility that in case of any change or decline in the immense amount of goods that he will have on hand, manufactured, in the process of manufacture or partly machined, he will sustain a loss that may in some cases, wipe the manufacturer entirely out of existence. It therefore seems fortunate that an organization of this kind exists that it may have its members meet and confer and that it may invite outsiders to come and discuss with them this most important situation that vitally affects the interests of every manufacturer. Further information as to details can be had by addressing Wm. M. Webster, 1818 City Hall Square Building, Chicago, Illinois.

On the evening of the second day's session, there will be a banquet and dinner, and the following gentlemen have been appointed as the banquet committee to make the necessary arrangements: A. S. Hills, chairman, Haydensville, Mass.; C. C. Hale, New Haven Conn., and C. H. Downs, Springfield Mass.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST.

A. B. SEELIG

Augustus B. Seelig, well known in metal circles as an officer of the Chase Rolling Mills Company, brass manufacturers, Waterbury, Conn., severed his connection with that company November 1, 1916. Mr. Seelig is one of the best known men in the brass business.

AUGUSTUS B. SEELIG.

Born and educated in Southington, Conn., he went to Waterbury in 1894 and became connected with Randolph and Clowes Company, seamless brass and copper tube manufacturers. After spending some time in the various departments of the business office he became attached to the sales office of this concern. In 1901 Mr. Seelig joined his fortunes with the Chase interests, becoming a member of the sales organization of the Chase Rolling Mills Company. During his connection with this firm, Mr. Seelig has represented them and introduced their products all over the United States.

Several years ago, contrary to the fixed policy of the Chase interests, he was taken into the firm as secretary of the Chase Rolling Mills Company and was made a director as well. At the time of his resignation Mr. Seelig was general sales manager of the Chase Rolling Mills Company, Waterbury, Conn., and also of the Chase Metal Company, Waterville, Conn. Mr. Seelig has not yet completed his plans for future activities.

W. W. Rogers, manager of the Riverside Metal Company's works at Riverside, N. J., has tendered his resignation to take effect January 1, 1917.

William A. Leigh, superintendent of the Metal Products Corporation, Providence, R. I., for the past ten years, has resigned to take a similar position with the Metallic Shell & Tube Company, East Providence, R. I.

F. A. Shepherd, formerly connected with the Curtiss Aeroplane Company, Buffalo, N. Y., as foreman plater, has become connected in a similar capacity with the International Steel & Ordnance Company, of Lowell, Mass.

DEATHS

Howard W. La Baw, superintendent of the Skillman Hardware Manufacturing Company, Trenton, N. J., was found dead in bed at his home in Trenton on November 25. Death was due to apoplexy. Mr. La Baw had been affiliated with the Skillman Company for the past thirty years, having become engaged by the late E. V. D. Skillman when the firm was first started, growing up with the company and finally becoming superintendent. Mr. La Baw is survived by his wife and sister.

George Austin Morrison, treasurer of the Metals Trading Corporation, New York, N. Y., died suddenly November 29 of heart disease. Mr. Morrison was born in New York City and was in his fifty-second year. Mr. Morrison was a member of many societies among which was St. Andrew's Society of which he was the head for a great many years. He was author of a number of works on genealogy and history and was a graduate of Harvard University, Cambridge, Mass., Columbia School of Political Science and Columbia Law School of New York. He is survived by his wife.

David N. Camp, one of the pioneer manufacturers of New Britain, Conn., and one of the founders of the Skinner Chuck Company of that place, died at his home there on October 16, aged 96 years. Death was due entirely to old age, and up to a few weeks of his death Mr. Camp, who was a former president and a member of the directorate of the Skinner Chuck Company, visited the office frequently and took a live interest in business dealings.

[A brief personal sketch of Mr. Camp was published in THE METAL INDUSTRY, September, 1915.]

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS.

WATERBURY, CONN.

DECEMBER 4, 1916.

With the approach of 1917 one finds that the greatest year for development of the brass and metal industries of this section of the country, and particularly of Waterbury and neighboring towns, is passing. Since the first of last January it has been marked by record-breaking progress, not only in the matter of plant extension and volume of business, but in many other lines. Just now the outstanding features seem to be the wonderful earnings of munitions makers here, and the positive character of the prospect for even greater earnings and activities in the immediate future.

The swift pace of filling war orders keeps the larger corporations hereabouts in full swing. It is not so material to the smaller producers of bar brass and metal ware, which are not in demand in warfare, but the activity of and demand on the larger plants still makes for the greater prosperity of their smaller neighbors, and domestic business is theirs in larger volume on that account. For these reasons it is a full stocking that is expected in the industrial community here throughout the Yuletide.

By the declaration of another 10 per cent. extra dividend, December 1, the Scovill Manufacturing Company made the total dividend for this year on its capital stock of $5,000,000 just 99 per cent. This has been verified by the assistant secretary of the company, C. M. DeMott. The company's extensive plant continues to extend, and is in full operation, with some 12,000 men and women employed on terms and conditions as to time and wages, which were never more attractive and satisfying.

Like the Scovill Manufacturing Company, the American Brass Company is working under full pressure with full steam ahead, and has made a remarkable record for extra dividends and business growth during the past year. Its additional buildings here,

in Ansonia, in Seymour, in Torrington, Conn., and in Kenosha, Wis., are even more extensive than the new plants of the extensive Chase Metal Works and the Scovill company combined, according to reliable information, and business is so plentiful that, with all this equipment, it is impossible to see relief from the pressure until orders begin to fall off.

With the Chase Metal Works the year has been quite as prosperous, and its new plants at Waterville continue to be expanded and improved. This month more work in that direction was undertaken, and the ground is being covered so rapidly that already it is plain that the company's shops and employees are bound to make Waterville and Thomaston grow beyond all expectations within the next few years.

The Waterbury Farrel Foundry & Machine Company is another wonderfully growing institution, and happens to be the first, practically, to feel the effects of a declaration of war in Europe. It was here that the first remarkable display of activity was noticed in 1914 when war burst forth abroad, for there were pressing orders for wonderful pieces of machinery for export immediately following the news of the outbreak, and machinists were in demand in every city of the country for work in Waterbury. The company's property is splendidly laid out today, and during the year has been greatly extended, and with excellent effect on the organization. Now it has leaped across Bank street, and is demolishing the old Earle hotel that a machine shop may be put in its place. It has just acquired the extensive property on Meadow and Benedict streets, adjacent to its present plant, of the Waterbury Lumber & Coal Company. W. Shirley Fulton, treasurer, denies that there are any plans for the immediate development of this property, but admits that it was purchased to provide for future growth. It has been in the hands of the lumber company since 1849, and seemed safe from invasion by the brass industries until now.

So it goes, along the list of manufacturing plants. One cannot think of one that hasn't found itself compelled to grow during the past 18 months, and the number of 1916 cornerstones on factory buildings is a record-breaker.

With the approach of the winter there have been some slight difficulties felt in managing this big business. Traffic has been hindered by embargoes against coal and general freight at different points along the New Haven railroad system. Just now there is an embargo against several factory points owing to congestion of freight on either New Haven or connecting lines. The railroad men claim that the condition is "easy" as yet, and think they may be able to escape the situation of last winter, but the prayers of the manufacturers for open weather are sincere and frequent. Material supplies are well provided, but it is necessary on account of the vast consumption of these to keep them moving into the factory towns steadily and regularly, so that transportation problems are absorbing.

One of the big problems of the past six months has been the fuel problem. Coal prices have been shooting upwards since September far beyond all expectations, and it is known that prices as high as $5.25 a ton at the mine have been paid for anthracite by some of the manufacturers, although it could be had in the early part of the year for less than $2. Owing to the experience of last winter the manufacturers have been more careful to anticipate their wants this year and seem to be well supplied, although they are still buying and shipping coal in as fast as the railroads keep it coming.

Labor is so scarce in the coal business on account of the conditions in the factories that men who shovel coal or drive coal wagons are paid $3.50 a day, as compared with $2 to $2.50 a year ago.

Progress is being made satisfactorily on the building of new homes for workingmen at the brass factories of the American Brass Company, the Chase works and the Scovill company, and spring will see scores of families installed in these new homes. Meanwhile several social features are being undertaken for the benefit of employees in the factories and quite within the program of the corporations themselves, and rather independent of outside influences. This is a new feature hereabouts, but the indications are that it will have a rapid development.

Smallpox in a mild form broke out in the city recently, and in all the larger manufacturing plants workmen are being vaccinated for protection against it, at the expense of the companies. There have been over 20 cases reported during the past two months, but all mild and easily controlled.—T. F. T.

BRIDGEPORT, CONN.

DECEMBER 4, 1916.

General business conditions in Bridgeport continue booming along as they have been during the past year or so. As Bridgeport is what might be termed a "shop" city, the marked activity in business circles can also be counted as a definite advancement in the metal industries.

Only in the last week or so one of the largest shops in Bridgeport has come under new management. The firm known as the American Tube & Stamping Company has been sold to a community of interests headed by Guy P. Miller, secretary and treasurer of the Bridgeport Brass Company.

The tube and stamping company is comparatively an old institution in Bridgeport, being founded in 1884 by Samuel H. Wilmot and William F. Hobbs, the latter a founder also of the Bridgeport Brass Company. When first started, the tube company manufactured only cold rolled iron, carriage hardware and other small articles of a similar sort. Later on the company was expanded, until at the present time there are three branches of the company and they produce a numerous variety of articles. The concern now manufactures open hearth carbon and Swedish steel, hot and cold rolled strip steel for springs, pressed, stamped and drawn work; in fact, everything in the steel and iron line. The plant employs at this time about 1,500 men and the new controlling interests contemplate increasing the output and necessarily the number of men employed.

In the electroplating line the numerous establishments in Bridgeport are working to the utmost of their capacities. There has been an added inrush of business, not only foreign, but local as well. A great part of the work is due directly, or indirectly, of course, to the European war, but nevertheless all the manufacturers agree in saying that domestic business had picked up to a remarkable extent the last year.

Silver plating especially seems to be booming the last few months, the different concerns having all the work they can attend to. The labor scarcity which so long handicapped the local concerns has almost entirely disappeared, there now being about normal relations between jobs and men to fill them. There is, though it must be admitted, greater opportunity for securing well paid positions now than there has been for many years in the city. One of the officials in charge of the Charities Department in the city said recently that there was absolutely no excuse for any able-bodied man in Bridgeport to be without work.

The engraving factories in Bridgeport are filled up with advance orders. The work pouring in faster than they can handle it. The Davis & Hawley Company is reported to be doing an extra large business lately and several of the other engraving firms also report great activity.

The casting, tinning, annealing, refining companies of the city are very busy, some of them having a slight difficulty in securing men. Taking a general glance at the metal conditions in the city at the present time it may truthfully be said that never in the history of Bridgeport has the trade seen such activity and prosperity as at the present. L. M. P.

NEW BRITAIN, CONN.

DECEMBER 4, 1916.

As the spring gave way to summer and the summer to fall without there being any apparent let up in the brisk business enjoyed by the several New Britain manufacturers, so also is the fall making way for the coming winter without any change. November, a busy month at all of the factories, is almost past and cold December looms up with every indication that there will be not the slightest cessation of business. Truly, New Britain is experiencing a business prosperity that is almost gratifying. As during the month of October, previously chronicled in THE METAL INDUSTRY, November has been a bustling one. Factories have all been working at top speed and in several instances even this was not enough, overtime schedules having had to be adopted. Early in the month newspapers in this vicinity carried big stories about a mammoth "war order" received by the North & Judd Manufacturing Company, an order given by the United States War Department that would take a year to fill. This story

naturally created the impression that the concern, as busy as it had been for the past year, would have to either enlarge or work several shifts to handle it, but Vice-President H. C. Noble said it would not be necessary. Eventually, it was learned from unofficial sources that the reported big "war order" was more or less of a myth, possibly circulated by "bulls" to boost the stock in the open market. At any event it is said that the company got a gratifying, but not abnormal order from the Rock Island Arsenal, Rock Island, Ill., and the order was so placed that deliveries will be made at various times throughout the coming year, thus giving truth to the published statements that the order would not be filled for a year. But withal, the North & Judd Manufacturing Company is doing a wonderful business and is steadily expanding. So much so that the stockholders expect at almost any time to hear of a quarter of a million dollars' stock increase, held in the treasury since last spring. The North & Judd Manufacturing Company manufactures harness trappings, buckles of all sorts and kindred goods. The Traut & Hine Manufacturing Company manufactures a similar line of goods with some novelties of its own, including garter and suspender buckles, safety razors, cigar clippers, etc. This concern is very busy and its business is so healthy that an extra dividend has been declared and another one promised.

All of the local concerns closed for Thanksgiving Day, though they could ill afford it. At the Union Manufacturing Company the men were requested to work overtime for three nights preceding Thanksgiving that the loss of products by the day's vacation might not be felt. Similar plans were adopted in several other concerns. The P. & F. Corbin plant has been very busy and various departments have had to work overtime.

The Skinner Chuck Company is also rushed with orders and is working an evening shift. This concern is a very close corporation and seldom it is that the public learns of its financial condition except as can be imagined by the business done. The inventory of the estate of the former president and one of the founders, David N. Camp, however, showed that the stock, par 25, was valued by conservative appraisers at 44. The plant has developed wonderfully of late and the business more than warrants the expansion.

Among the other very busy concerns is the Stanley Works. This plant is so busy that it cannot handle all orders. The profits are so large in proportion that stockholders, not content with an increased dividend rate and an extra dividend as well, are now anticipating an increase in capital, made possible by a special act of the last legislature. The Stanley Works has lately acquired a defunct, but practical, power plant a number of miles to the northward and is about to utilize it. It is not thought that the concern will sell the electricity generated, but will rather use it for its own motive purposes.—H. R. J.

PROVIDENCE, R. I.

DECEMBER 4, 1916.

The year now drawing to a close will pass into the industrial history of Rhode Island as one of the best, if not the best, ever experienced by the metal trades. In this respect there will be no exception, unless possibly it may be as regards those trades that are affiliated with the manufacturing jewelry industry. Even these, however, have enjoyed a far better trade than is usually vouchsafed to them, so that upon the whole conditions approach record breaking.

The almost phenomenal activity has been due in a very large measure directly and indirectly to the war, which has prevailed in Europe. Every concern making anything pertaining to war munitions has been driven at top speed night and day, makers of machinery and small tools have been unable to keep pace with overwhelming orders, and the great demand for work, coupled with the scarcity of help, has resulted in higher wages being paid than ever before known.

Some idea of these conditions may be realized when it is stated that the Brown & Sharpe Manufacturing Company, which normally employs between 3,500 and 4,000 men, now has a payroll of over 10,000; that the Gorham Manufacturing Company, with a normal force of 1,800 to 2,200, now employs fully that number in its munitions plant alone, in addition to its full complement in the regular departments. In addition to these, practically every concern handling or manufacturing any description of metal work has doubled and tripled its regular force, and is still calling for more help.

While there are indications of a slight slacking off in the demand for war munitions and materials, all the local concerns continue to hire anybody and everybody desirous of work, and the prospects seem to indicate a continuance of activity for an apparently indefinite period. One phase of the situation is that there have been comparatively few failures among the metal workers of Rhode Island during the year 1916, and there appears to be a general spirit of prosperity.

During the year numerous large additions have been erected to existing plants, and several new plants have been established The largest and most important of the latter is the plant of the United Wire & Supply Company that is being erected on Elmwood avenue in Auburn, and which will probably be ready for occupancy the latter part of January. When completed the corporation will abandon its plants in this city and Pawtucket, and concentrate at the new site. The Gorham Manufacturing Company has extended its plants to a considerable extent, building in such a manner that the new structures can readily and with little expense be converted immediately into serviceable room for its regular work as soon as the war demands have ceased. The Brown & Sharpe Company has also largely increased its number of square feet of factory room, while the American Emery Wheel Works, Philips Insulating Wire Company at Pawtucket, and many others, have added materially to their facilities.

The Fairmont Foundry Company is erecting a one-story frame and concrete foundry building, 70 by 89 feet, with an ell 70 by 14 feet, on Second avenue, Woonsocket, costing $10,000.

The directors of the Gorham Manufacturing Company have appointed William S. Stone, head of the publicity department and assistant treasurer, to be assistant secretary.—W. H. M.

BUFFALO, N. Y.

DECEMBER 4, 1916.

The volume of business increases in this city as the prices of materials rise. Rush and time orders come almost unbidden, and the need of more first-class workmen is continually felt.

The National Bronze Foundry reports a single order for castings for condensers which alone would keep it busy through the winter. This order was given by a Buffalo firm. In addition there is a great deal of work for marine engine manufacturers.

The Curtiss Aeroplane Company has placed a large order with the Washington Plating Works. Other new orders secured by this firm are for 300 nickel-plated cylinders and 20,000 pliers. The concern is working to capacity now.

The Unique Brass Foundry Company reports being rushed with auto castings and general work, and has recently declined munition contracts from Canada.

The Lumen Bearing Company, which recently put up an addition 30x129 feet for foundry purposes, will soon begin work on another addition 30x100 feet, also for foundry purposes. This company has made a report on the Baily electric furnace, which it tested out for several months on an arrangement with the manufacturers, the Electric Furnace Company of Alliance, Ohio, to whom the report was made. The Lumen Bearing Company has also ordered one of these furnaces built to its own specications, but has not decided, it was said by the superintendent on November 24, to exchange its gas furnaces for electrics.

The electric furnace with which the experiment was made attained a temperature of 2,000 degrees Fahrenheit, with 1,400 degrees in the bath, but the one ordered for the Lumen company must attain much higher temperatures. A charge of 1,000 pounds was used in the test, and from six to eight heats were taken out in a day, six days a week. The electric furnace was said to work especially well with the Lumen metal, which is an aluminum alloy. R. E. D.

DETROIT, MICH.

DECEMBER 4, 1916.

The business outlook for the month of November in this vicinity is problematical at the present time as metal manufacturers have predicted that the metal market will not drop in price for a year or more. The consumption of copper, especially by the Allies is enormous which, with the home, demand keeps the price up.

The average exports of copper for the first ten months of this year run approximately 64,000,000 pounds. The general opinion of all manufacturers of brass goods here is that a cessation of the war means that the bottom will drop out of the metal market and not until then.

There is every probability of prices being increased on brass goods to meet the market prices of metal. Business is still booming with the manufacturers and all plants are running to their full capacity.

The Detroit Bearing and Casting Company have decided to enlarge their plant.

The Marvel Brass Manufacturing Company, Rivard street, manufacturers of the Marvel carbureter, which is used on a number of the leading automobiles, are running at full capacity to keep up with orders.

Holly Brothers, Ravina street, are equipping their shop with all the latest appliances and tools to take care of the large business they have on hnad.—P. W. B.

COLUMBUS, OHIO

DECEMBER 4, 1916.

The metal market in Columbus and central Ohio territory is ruling firm in every particular. Trade is good, and the volume of business is holding up well. Advances have been recorded during the past month in many varieties of metals, and strength, is the chief characteristic at this time. The consumption of metals is good in this territory, and quite a few new concerns using metal have started business recently. Metal jobbers and salesmen believe that the demand for all varieties will hold up during the winter months. Buying for delivery the latter part of 1917 is now in progress, and some inquiries have been received for early 1918 delivery. Supplies are not very large; neither is there a marked scarcity in any items.

Brass is ruling much higher in the local market. Heavy red brass advanced from 16 to 20 cents, while heavy yellow brass is now quoted at 16 cents. Light brass is selling around 14 cents. Copper is also strong, being quoted at 32½ cents. Aluminum is about the only metal that has shown a weakness. The price to the trade is now around 35 to 38 cents. Zinc is in good demand at 12¼ cents, while tin is strong at 45¼ cents. Babbitt metal is firm, and the same is true of all type metals.

Columbus officials realized what it means to buy copper when the spot price of the metal is running in excess of 30 cents a pound, instead of 15 cents or lower, as was not unusual before the European war demands arose. Bids for the extension of the municipal lighting plant to include service for commercial purposes were opened by the city purchasing department. The General Electric Company was the lowest bidder for 37,370 pounds of copper, and its bid was $11,655.—J. W. L.

CLEVELAND, OHIO

DECEMBER 4, 1916.

Two factors that are expected to seriously handicap operations in nearly every metal industry plant in this city and territory, have had their preliminary fling at the business this past month. They are the coal shortage and the reduced supply of natural gas to manufacturing plants. The coal shortage is due to the inability of the railroads to get cars. The ruling of the Interstate Commerce Commission to increase demurrage charges, effective the first of December, raised such a protest, that the ruling will not go into effect for three months. Meanwhile, although this plan was offered as a relief from long holding of cars, none can be expected from such a source. State and municipal investigations have caused the natural gas companies to cut off the supply of that fuel to manufacturing establishments, in order that householders may have sufficient fuel for domestic purposes.

This condition arises at a time when all metal industries are busier than they ever have been. The situation, as far as regular business activity is concerned, is shown by M. H. Glauber, of the Glauber Brass Manufacturing Company, in the East End. Mr. Glauber says his firm has $150,000 orders it cannot fill, although the plant is working to capacity, and five hours' overtime daily. Some of these unfilled orders are two months old. This is the busiest period in the history of this firm, and not a penny's worth of war orders has been taken, says Mr. Glauber. Only the regular lines for construction work are being handled, he reports.

The Central Plating Company, Vincent avenue, near East Sixth street, now is in pretty good shape following the fire on election night which did $1,500 damage. The blaze started from some unknown cause, and would have done less damage, had not the firemen been hampered by the dense crowds which were out to watch the election returns.

Investigation still is being conducted into the cause of the fire at the Aetna Brass Manufacturing Company's plant at Hamilton avenue and East 38th street. The building was partly destroyed, and the blaze endangered adjoining property. The flames were confined to the foundry, although some damage was done to machine shops and offices. All told the loss is $10,000.

Merger of the Standard Welding Company and the Perfection Spring Company, was completed November 21. The new name selected for the concern is the Standard Parts Company, and it will be probably the largest producer of automobile parts in the country. Christian Girl, former president of the Perfection, it is understood, will be the active operating head of the new concern.

Because it is handling nothing but straight American business, and no war orders, the Cleveland Galvanizing Works Company claims this is the reason it needs more factory space. It has just started work on a new building which will occupy a plot 330 by 60 feet in the East End.—C. C. C.

CINCINNATI, OHIO

DECEMBER, 4, 1916.

While in some lines things have been rather quiet of late, the quiet is only by comparison with some of the extraordinary activity which has been seen during the past year in the metal trades and allied industries; and orders on hand, with prospects in the various consuming industries, indicate that the current month, with the exception of the holiday season, will be quite as busy as any of the year. The machine shops are still running to their maximum capacity, the cry being on all sides that labor is not to be had, and measures are being discussed to secure additional skilled help. This, of course, is not the work of a moment, and the extension of the apprentices' schools now operated in the city, as well as other expedients, are to be tried as a means of increasing the available supply of high-class men.

In the meantime, the foundries have all that they can do to keep up with the demand for castings, especially in view of the high prices and slow deliveries of metal. The car situation, which continues to furnish the most irritating factor in the industrial situation, has so far not improved, and is not only interfering with the movement of manufactured products in all directions, but with the receipt of the necessary fuel for the operation of the shops. The coal shortage noted all over the country is not by any means as serious in Cincinnati as in many cities, by reason of the fact that the city is near to the great West Virginia and Eastern Kentucky coal fields, and also has the supply shipped via the Ohio river from the Pittsburgh district; but, at the same time, there has been a marked scarcity of steam fuel and the prices are correspondingly high. Many concerns using gas for fuel were forced into the coal market about the middle of November, when, as usual, the available gas supply was cut off for the sole use of domestic consumers. Aside from these factors, the industrial situation is all that could be desired, and the amount of business on hand and in prospect promises an indefinite continuance of the activity referred to.—A meeting was held in Cincinnati a short time ago, the outcome of which may be the organization of one of the largest valve and

pump concerns in the country. While, as might be expected, none of those present at the meeting would discuss the matter, it is understood that a consolidation of a dozen of the largest concerns now doing business in the lines indicated is in view, the capitalization of the concerns named as interested being around $10,000,000. It is said that the Cincinnati house represented at the meeting was the Bourbon Copper & Brass Works, but Mr. Thomas Ford, president of the company, refused to discuss the merger rumor, stating that general trade conditions only were discussed. The other firms represented are said to include the following: Chapman Valve Company, Indian Orchard, Mass.; Norwood Engineering Company, Boston; Darling Pump & Valve Manufacturing Company, Williamstown, Pa.; Pratt & Cady Company, Hartford, Conn.; Renssalaer Valve Company, Troy, N. Y.; Flower-Stephens Manufacturing Company, Detroit, Mich.; Ludlow Valve Manufacturing Company, Troy; Columbian Iron Works, Chattanooga, Tenn.; Kennedy Valve Manufacturing Company, Elmira, N. Y.; Iowa Valve Company, Oscaloosa, Ia.; Glamorgan Pipe & Foundry Company, Lynchburg, Va., and the Cincinnati company named.

A fire which occurred in the plant of the Manufacturers' Production Company, a munitions concern of Dayton, O., on the morning of November 23, caused a loss of several hundred thousand dollars, the buildings and equipment being completely destroyed, with a large quantity of material and finished goods. The blaze is supposed to have started by short-circuiting in the electric wiring. Six hundred men were employed in the plant.—K. C. C.

LOUISVILLE, KY.

DECEMBER 4, 1916.

Starting November 3, and winding up November 22, the Interstate Commerce Commission handled a probe in Louisville of the acute car shortage which is affecting the entire West and South. During this hearing it was shown that the North has been suffering greatly for lack of coal and coke, and that many plants have had trouble in getting enough fuel to operate full time. It was brought to light that the trouble was due to a shortage of cars in the South, these cars all being away from home and tied up on lines in the East and North. The mines in Kentucky, Tennessee, Virginia and West Virginia have been unable to get cars to load, and the railroads have been unable to get their cars returned from the Northern lines, which have not been observing car service rules and regulations as laid down by the American Railways' Association. It was said that the real cause for the shortage was due to a heavy movement of shells and other materials to Eastern ports for export, and failure to secure loads for the Western trip, with the result that there has been a shortage in all classes of cars. There was a long argument when it was found that coal cars were being used in the Northwest to handle ore, while the coal scarcity was at its height, but the Northern lines showed that such equipment is always used for handling ore, and that the mines had to be served.

The upshot of the investigation was that the commission ordered all carriers to return all foreign coal car equipment on their lines to the owning railroads, and has undertaken to see that the orders are carried out, and the North relieved. The shortage in box cars is to be taken up at Washington, where the hearing was continued after adjourning at Louisville.

The hearing brought out the fact that the railroads were not able to make rules for themselves and enforce the rules, and it now looks very much as though the Interstate Commerce Commission will step in and do the regulating in the future. The entire shortage has been a result of inefficiency on the part of the carriers, and slowness on the part of shippers to load and unload at terminals.

Prices of metals worked upward somewhat during the month, but the demand and consumption is not very great among the coppersmiths of the Louisville district at this time. Deliveries are better than they have been for some tme, and are coming through satisfactorily. Quotations are as follows: Sheet copper, base price, 40 cents; tubes, base, 45 cents; ingot, 33½ cents; scrap brass, light, 16 cents; heavy, 20 cents; scrap copper, 25½ cents.

The railroads are now getting into the market for supplies of metal of various kinds. The Louisville & Nashville Railroad Company, of Louisville, has just announced that it would build, or contract for several thousand cars. Most of the cars will be manufactured in the company's shops at Louisville and New Decatur, Ala., and will require thousands of pounds of brass in journals and other equipment. The bulk of the car building will be done at the main shops at Louisville. Several other roads have announced large car building orders lately.

Matt Corcoran, Jr., of Matt Corcoran & Company, reports that his company has been very busy on a number of good jobs out of the city, and that the year as a whole has been a good one. Mr. Corcoran, in commenting on the outlook for 1917, said that in his opinion it was good, but that there were many who didn't take this view. He stated that in his opinion the people who really decided to do anything would go ahead regardless of high metals, high labor, grain, coal, etc., and that while there was a lot of state wide prohibition talk, he didn't figure that it could really have any great effect for at least two to four years.

The Standard Sanitary Manufacturing Company, of Louisville, enamelers and manufacturers of a general line of plumbing goods, are working full time in every department at this time, and are busy with the erection of certain additions to the plant. The demand for such goods has been extremely good during the past few months, building having shown good increases as compared with last season and 1914.

The James Clarke, Jr., Electric Co., of Louisville, manufacturers of machine tools, electric equipment of various kinds, and large jobbers of electrical goods, is contemplating the erection of a foundry to handle brass and iron work in connection with its plant on Shelby street. The company is four months behind on certain orders at this time, and reports that it is not handling any war business. James Clark, Jr., head of the company, attributes the activity to the general prosperous condition of the country as a whole.—O. V. N. S.

NEWARK, N. J.

DECEMBER 4, 1916.

The metal industries of Newark are very busy at the present time, and the outlook is good for the months immediately ahead, unless some great disturbing force not now expected appears. There is not quite the rush in munition works that there was several months ago, but what might be termed the legitimate lines are generally doing good business. As is customary, there are varying degrees of prosperity in the different lines and among firms in the same line. Some concerns are unusually busy, some find things a little slow, but the majority, between these two extremes, are doing a good business. High prices and inability to get certain goods, or to get goods on time, have failed to keep business from going ahead, and it would forge ahead faster if it were not for these handicaps.

The manufacturing jewelers as a class have done a fine business this fall, and most of them expect that at the end of the year their books will show a considerable gain over last fall, which was considered a good one.

Manufacturers of silver goods are likewise very busy, there being a good demand for their products at the present time.

Platers and polishers share with other kindred lines in good business, though some could handle more than they are doing. Some complain of the high cost of materials, which has cut down their profit, as they have not been able to pass on all the increased cost.

Money is easier and more plentiful than it was, and general business conditions are good. This does not mean that manufacturers and business men are having an easy time, or that all of them are getting rich, for there are many perplexing factors, and in many instances more business must be done than heretofore to get the same profit.—R. B. M.

TRENTON, N. J.

DECEMBER 4, 1916.

Prosperity continues along the metal industry lines, and all the Trenton plants report progress. One of the largest of the Trenton plants manufacturing copper products, the John A. Roebling's Sons Company, is turning out big orders in the copper cable department, and is furnishing copper wire for corpora-

tions in various parts of the country. Copper wire is fast taking the place of steel wire for different purposes, and this causes a demand for the former product. For many months following the destruction of the company's cable department by fire the orders were turned out in plants outside of the city. A larger and more modern copper plant has been erected, and the orders here have greatly increased. The building of many vessels in the various shipyards along the Delaware river in this section causes a boom to the metal industry.

The Skillman Hardware Manufacturing Company is very busy, and is turning out a big order for builders' hardware in various sections of the country. The demand for hardware is always a sign of prosperity, and the Skillman product is sold at good prices. William G. Wherry, president of the company, says there is such a little change in the metal market that all orders must be filled on the same base. Following the big increase in the price of brass and copper the company had to revise its selling list.

The Ingersoll-Trenton Watch Company continues very busy, and has a big force at work. The company has enough orders on hand to keep it running full handed for some time. Many of the watches produced here are sent abroad. The European war caused a big boom at the Trenton plant.

One of the busiest plants in the line of metal industries is the Keystone Watchcase Company at Riverside, N. J. The concern is unable to get enough help to fill the many orders, and was compelled to advertise in different sections for experienced operators. The Standard Fuse Corporation at Bordentown was closed for a week during the past month because of a shortage of materials. The company found difficulty in securing enough castings, but later got enough to start up the works again. There are 1,000 hands employed at the plant, and all were compelled to take a week off during the delay in material. The company has plenty of orders to keep the plant busy for many months.

The Jordan L. Mott Company is very busy in its ammunition department, and is using considerable brass in the manufacture of munitions. The company is working on its second big war order.

Billingham Foundry & Machine Company reports business good for the fall season, and expects to be busy all winter on general lines of work.

Morris Movshovitz & Son, distillers of high grade spelter, are turning out a big supply of zinc for the various watch companies.

The New Jersey Chemical Company, which recently began the production of zinc oxide from scrap materials, reports that they are unable to turn out enough product to supply the demand.

The Trenton Smelting & Refining Company, Trenton Brass & Machine Company, McFarland Foundry & Machine Company, National Electro Plating Works, the Bechtel Engraving Company, and the East Trenton Electro Plating Works report business good at this time.—C. A. L.

NEW YORK, N. Y.

DECEMBER 4, 1916.

Contrary to all tradition, the forthcoming presidential election is having no effect, apparently, upon the local metal men and their customers. The question of which way the presidential pendulum is going to swing does not seem to interest them as it used to. They appear to be confident as to its outcome, and therefore they do not hesitate about entering into a business transaction; and neither do their customers.

The present volume of business which is being done by the local men is said to be satisfactory; also that the prospects for the future are very good.

As reported last time, there continues to be a general scarcity of labor. This is a more trying situation with some of the metal men than with others. Real skilled workmen are much in demand, and, as a result, the workmen have assumed a peculiar attitude. The various plants are compelled to labor under the sometimes trying experience of having frequent change of men. The skilled workmen have assumed an indifferent attitude toward the employer because there is plenty of work to be had. As a result they shift from one job to the other. This is a serious problem for the employers because each establishment has its peculiarities, and these must be taught to every new man. And when he leaves he takes with him a certain amount of the employers capital. Consequently, every time an employe is hired or quits the firm is investing a certain amount of its capital which is apt to be lost.

Rush orders have been coming in to a good many of the local concerns, during the last month. This rush is due to a "grand rush" which is being made by their consumers who wish to get a good deal of their work done before the holidays or before the winter sets in.

The present activity among the local foundries is very encouraging, and, judging from the volume of orders now on hand, it may be expected that they will be busy for some time to come; yet the foundrymen seem to be troubled. They say that it is very difficult for them to continually boost their prices in proportion to the advance of materials and equipment. And as one foundryman put it: "It is easy enough to convince a customer that you must advance your price because of the advance in copper and other metals, but he fails to reason with you when you say the price should be raised because the price of our coal has been advanced one dollar; because crucibles have been steadily advancing from $1.75 to $5.75; or because your bellows and other equipment have gone up. He fails to realize that crucibles, as I used to buy several years ago, which would last me two weeks now only last about a week. All of this means an increase in the cost of production. He thinks you should throw all of this in for nothing."

Nearly every electroplater is working to full capacity. Most of them report a steady increase in their volume of business since the latter half of August. This is particularly true of some of the jewelry platers who are getting wares ready for the holiday trade which is about to break. The prevailing high price of chemicals continues to cut into the platers' profits, especially those who are operating under a blanket contract. Generally prices are said to be fair.

The demand for finished or rolled metals is exceptionally good. In fact, it is safe to say that the demand far exceeds the supply. Salesmen of some of the rolling mills say that their firms have enough orders on their books to keep them busy for the next twelve months without a halt. Prices are firm and very little copper is lying around this market. A great many of the salesmen of rolling mills are often obliged to throw down an order simply because their firm is not in a position to care for the immediate demands of the trade.—G. W. G.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Buffalo Copper & Brass Rolling Mill, Buffalo, N. Y., is erecting a new building which will be used as a die shop.

The Brady Brass Company, Jersey Cit, N. J., has added a few new machines to its equipment. The departments operated are brass, bronze and aluminum foundry, brass machine shop and grinding room.

Among the recent large orders placed in this country for munition material was one of 4,000,000 pounds of brass rod contracted for by B. Lissberger & Company, Woolworth Building, New York, N. Y., with the New Jersey Tube Company, of Harrison, N. J.

The Doehler Die-Casting Company, Brooklyn, N. Y., has let the contract for a steel and concrete addition to its plant. The addition is to be 50 by 100 feet, seven stories and will cost approximately $150,000.

The Galt Brass Company, Galt, Ontario, Canada, plans to construct an addition to its plant. Smelting and refining, brass and bronze foundry, brass machine shop, tool room, stamping, plating and polishing departments are operated by this company.

The Connecticut Brass Company, Inc., Cheshire, Conn., has awarded the contract for a one-story casting shop, 40 by 140 feet, estimated to cost $25,000. Besides a casting shop the company operates a rolling mill, brass machine shop and tool room.

The United Metal Company, Norwich, Conn., is erecting an addition to its foundry, 105 by 30 feet. The departments operated by this company are brass foundry, brass machine shop, tool and grinding rooms, soldering, plating, polishing and lacquering.

The F. H. Lovell & Company, Arlington, N. J., are making new additions to its plant and also installing new machinery to be used in filling a United States Government contract which will amount to about $1,250,000. This contract is in addition to regular work.

Booth Coulter Copper and Brass Company, Ltd., 115 Sumach street, Toronto, Canada, will construct an addition to its plant, which will cost about $5,000. The company operates a brass foundry, brass machine shop, tool room, and spinning, stamping, brazing and plating departments.

The Chase Rolling Mill Company, Waterbury, Conn., is building an addition to its storehouse on East Farm street, 68 by 93 feet, and the Chase Metal Works, Waterville, Conn., has secured a permit for the erection of a storehouse on Thomaston avenue, 62 by 200 feet, one story.

The Maiwurm Aluminum Corporation, Pittsburgh, Pa., is building an addition to its old kitchen utensil factory and when completed will be used for making aluminum die castings exclusively. The addition will be 50 by 160 feet and will be in operation by the fifteenth of December.

Virden Manufacturing Company, Cleveland, Ohio, manufacturer of brass specialties, has awarded the contract for a one-story, 75 by 130-foot addition to its plant. The departments operated by this company are as follows: brass machine shop, tool room, spinning, stamping, plating, polishing, lacquering.

The Metal Drawing Company, St. Catharines, Ontario, Canada, has let a contract for the construction of a foundry and are in the market for general brass foundry supplies. This company operates a brass foundry, brass machine ship, tool and grinding rooms, casting shop and spinning and stamping departments.

The Abbott Ball Company, Abbott street, Elmwood District, Hartford, Conn., originators of the Abbott process of polishing, burnishing and buffing by means of steel balls, are now manufacturing highly finished small copper balls for use in primers. They are prepared to furnish these balls in large quantities.

The United State Magnesite Corporation, 11 Pine street, New York, N. Y., has been organized to mine, mill and ship all grades of magnesite including the crude, calcine, dead burned, also calcine and ground, and is now in a position to offer all grades of foreign and domestic magnesite of the highest quality at lowest market prices.

The Stewart-Warner Speedometer Company, 1828 Diversey Parkway, Chicago, Ill., has awarded contracts for an iron foundry, 122 x 530 feet; a core building, 70 x 80 feet; a brass foundry, 100 x 100 feet and a storage building with 5,000 feet of floor space, to be erected at Beloit, Wis. The estimated cost of this construction is $300,000.

H. S. Wyckoff, well known in the plating supply business, is now representing The Harshaw, Fuller & Goodwin Company, 102 William street, New York. Nickel anodes are a specialty of this company, and they also furnish dynamos, plating tanks, rheostats, burnishing soaps, etc., and estimate on complete plating and polishing equipments.

The Aluminum Ore Company, a subsidiary of the Aluminum Company of America, Pittsburgh, Pa., has bought a tract of 200 acres or more at Sollers Point, near Sparrows Point, Md., on which it proposes to build a plant for refining bauxite, from which aluminum is extracted. It is reported that the plant to be erected will cost $8,000 000 and give employment to 3,000 men when in full operation.

The United Metal Manufacturing Company, Norwich, Conn., is building an addition to its foundry, 30 by 60 feet, and when completed the foundry, will contain 14 furnaces. In the spring the company expects to make a further addition of 45 feet, and will then have 22 furnaces. A brass and bronze foundry, brass machine shop, tool and grinding room, plating and polishing departments, are operated at this plant.

Frederick Lowber announces his withdrawal as western representative of the United Smelting & Aluminum Company, New Haven, Conn., and has formed other connections which will permit him to serve customers to advantage on aluminum, ingot brass and bronze, babbitt metals, etc. He is now connected with the Peninsular Smelting Works, Detroit, Mich., as general sales agent and is in a position to furnish ingot and granulated aluminum in all grades.

The International Metal Stamping Company, Detroit, Mich., which was incorporated in September, 1916, with the following officers: O. L. Currier, president; Wesley Kendall, vice-president; H. G. Percival, secretary, and C. E. Parkman, treasurer, has purchased the plant of the Diamond Manufacturing Company, which it intends to equip for the manufacturing of all kinds of sheet metal stampings for the automobile trade. The company will make all its own tools and dies, and has already ordered the first instalment of equipment, but will be in the market later on for more.

FIRES

A large fire, resulting in the loss of approximately $125,000 in Lockport, Ill., threatened to destroy the plant of the Lockport Chemical Works on the evening of November 23. The city fire department was quickly on the field, and by keeping the buildings covered with a blanket of water prevented serious damage.

The plant of the Fitzgerald Manufacturing Company, Winsted, Conn., which was badly damaged by fire and water on October 12, is now being operated to full capacity in every department. The concern is employing about 200 hands at the present time, but is gradually increasing the number of employees. This company recently put into operation a new casting plant, and also has a force of men rolling brass and copper.

REMOVALS

The office of the General Platers' Supply Company, Inc., has been moved from 29 Broadway to 18 Broadway, New York.

The office of the U. S. Electro Galvanizing Company manufacturers of platers' and galvanizers' equipment, has been moved from 1 Park avenue to 280 Park avenue, Brooklyn, N. Y.

INCREASE IN CAPITAL STOCK

The Sanitary Brass Works Company, manufacturers of plumbers' supplies, 1805 First avenue, New York, N. Y., has increased its capital stock from $5,000 to $10,000.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To manufacture plumbing supplies and brass goods.—Clefton Company, Owatonna, Minn. Capital $25,000.

To manufacture tools, dies, metal products.—Inland Machine Works, St. Louis, Mo. Capital, $30,000. The company operates a tool and grinding room and stamping department.

To deal in metals.—Metals Service Company, Cleveland, Ohio. Capital, $1,000. Incorporators: Elmer W. Waite, J. A. Freund, F. M. Wheeldin, L. D. Greenfield and J. G. Reyant.

To do metal work.—The Alexander-Kramer Company, Dayton, Ohio. Capital, $15,000. Incorporators: Joseph Kramer, J. G. Alexander, Clara Alexander, Lila Kramer and W. W. Schulman.

To manufacture metal products.—Premier Manufacturing Company, Ravenna, Ohio. Capital, $10,000. Incorporators: C. H. Judkins, R. D. Judkins, R. H. Hunter, A. L. Welch and M. L. Billenstein.

To manufacture metals.—E. A. Schwarzenberg Company, Cleveland, Ohio. Capital, $200,000. Incorporators: Ephraim A. Schwarzenberg, Walter Lucas, Max Pressler, Clyde A. Seeley and Louis H. Schwarzenberg.

To manufacture crucibles, graphite, etc.—Dominion Crucible Company, Ltd., Montreal, Canada. Capital, $200,000. Incorporators: Francis G. Bush, George R. Drennan, Alexander G. Yeoman and others.

To manufacture metal products.—Titanic Manufacturing and Machine Company, Cleveland, Ohio. Capital, $10,000. Incorporators: Walter J. Schmidt, Anton Spanowski, Harry R. Forsyth, William J. Benis and Harry Jackson.

To manufacture brass and gray iron castings.—Colonial Foundry & Machine Company, York, Pa. Capital, $20,000. Incorporators: James A. Constantine, J. E. Baker and George R. Shenberger. The company has opened a foundry and machine shop in Columbia, Pa.

To manufacture electrical supplies, etc.—The Eclipse Plating and Sales Company, Ltd., Ottawa, Canada. Capital $50,000. Incorporators: John Dorning, Philip M. Grimes, Frederick D. Hogg and others. The company operates tinning, soldering, plating, polishing and lacquering departments.

To mine antimony.—The North American Antimony Smelting Company, Ltd., with a capitalization of $2,000,000, has just been incorporated. It is presumed that the company is being organized by the American interests that recently secured an option on the antimony mines at Lake George in the St. Stephen consular district.

FOREIGN TRADE OPPORTUNITIES

For addresses of these inquiries apply to Bureau of Foreign and Domestic Commerce, Washington, D. C., and give file numbers.

23036. **Metals.**—A firm in Denmark desires to represent American manufacturers and exporters of antimony, copper, lead, tin and aluminum interested in extending their business in that country and in Norway and Sweden. References.

23054. **Metals.**—The Bureau is in receipt of a letter from a business man who wishes to purchase for export to Switzerland metals, much as brass, nickel, and white metal in rods and sheets.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Crucible Furnace.—The Iler Company, Cleveland, Ohio, has issued a folder giving illustration and data concerning the Iler draw crucible furnace. This furnace was described at some length in THE METAL INDUSTRY for December, 1914. Prices will be quoted upon request.

Trucks and Turntables.—The Whiting Foundry Equipment Company, Harvey, Ill., have issued catalog No. 124 which is devoted to descriptions and illustrations of their line of standard steel trucks and turntables for industrial plants. There are also included descriptions of core oven cars and trucks. Copies may be had upon request.

Copper Cables—The General Electric Company, Schenectady, N. Y., has published bulletin No. 49,300 which is devoted to descriptions and illustrations of armored cables used for conveying high tension electric currents in dry subways and tunnels, on bridges and generally in iron pipe conduits and overhead through city streets on messenger wires.

Machine Tools—The Newton Machine Tool Works, Philadelphia, Pa., has just issued catalog No. 51, containing descriptions and illustrations and specifications of cold saw cutting off machines. This catalog has been issued due to the greatly increased demand for cold metal sawing machines of which the output has been increased in some instances from 300 to 500 per cent.

Valves and Fittings—The Watson-Stillman Company, New York, N. Y., has issued sectional catalog No. 94, superseding catalog No. 78, of hydraulic valves and fittings. The line of valves and fittings described in the catalog are made from three materials—bronze, forged and cast steel; the bronze being produced in the company's own foundry of a special mixture of copper, tin and zinc. The designs are made with as simple a construction as is possible with the high pressures used. Copies of this catalog may be had upon request.

Metal Goods and Specialties.—The Gem Manufacturing Company, of Pittsburgh, Pa., in catalog No. 8, consisting of 48 pages, give full descriptions, illustrations and price lists of the steel and brass oilers, flexible shafts, portable and breast drills, emery grinders and other specialties in stamped metal of which they are the sole manufacturers. The catalog also contains a list of general supplies which this company has added to its line from time to time, and there is included in the book an extensive index. Copies may be had upon request.

Polishing and Drying-Out Machinery—A new catalog has been issued by the Smith, Richardson Company, Attleboro, Mass. A list of the different kinds of goods that can be finished by means of the different types of polishing and burnishing machines described in the catalog includes jewelry, silver novelties, optical goods, surgical instruments, safety razors, pencil tubes, gold teeth or crowns, watch crowns or pendants, bathroom fixtures, curtain rods, pens, gold, silver, brass or German silver chains, cups, tubes, ring settings, scarf pins, studs, beauty pins, goods that are inlaid with hard enamel, and other articles too numerous to mention.

Metal Machinery.—Catalog A. Seventh edition of rivet, bolt and nut machinery has just been issued by the Waterbury Farrel Foundry & Machine Company, Waterbury, Conn. This catalog is uniform in character with former catalogs which make up the series issued by this company. The one interesting feature of the catalog is the fact that it is indexed, the index page consisting of a blank page for the insertion of memorandums relating to the machinery described in the indexed section. The catalog covers cold process machinery for heading, re-heading, head trimming, screw threading, slotting and pointing, riveting, drilling and nut blanking of metal articles with photographs and specifications complete.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REPORT

NEW YORK, DECEMBER 4, 1916.

COPPER

There have been one or two cables from London during the month asking "Is the Copper market rigged?" The answer is so palpable and so simple—it would only take two or three letters at the most—and we feel perfectly safe in leaving it to our readers to decide. Our super-delicacy of feeling naturally prevents us from blurting out the naked truth and we have to be so careful about hurting other people's feelings.

As a matter of fact the price of electrolytic copper during the month of November has been advanced about 5½ cents a pound from 28¾-29 cents for November-December at the latter part of November to 34½ paid for December Electrolytic on November 28. The pose of the large producers has been all the month that there would not be enough copper to go around, "Sold up for the first half of 1917, nothing to offer before July," etc., etc. This kind of dope (please excuse our sporting editor's slang) seems to have got on consumers' nerves. They certainly all acted crazy and bought up wildly any and all the copper they could get hold of and as far ahead as possible—the higher the price the more they wanted the copper. We believe this propaganda stuff about scarcity of copper for 1917 is all rot. It reminds us of the situation of the copper market at the end of April this year. It is very interesting; let us go back to it—it won't take a minute—you have time. Well, there had been a big buying movement in April and on April 28 it was reported there was an inquiry in the market from Russia for 15,000 tons of copper—in those days 15,000 tons of copper was quite a lot of copper. To get this report confirmed we went round to the big producers and were told by one of the big men that "It would be a difficult matter to find that much copper for 1916 delivery." That was on April 28 last, and since that date the sales of copper for 1916 delivery have amounted to fully 1,000,000,000 pounds. And yet in April one of the large producers stated it would be a difficult matter to find as much as 30,000,000 pounds. Today the price of electrolytic copper for next year is from 30 to 32 cents per pound and the same story is being given us about supplies for 1917. It is time for consumers to "Stop, Look and Listen," before committing themselves to buy and pay 30 to 32 cents for copper for six months or one year ahead that costs less than 10 cents to produce and that can be produced in almost unlimited quantities. Ask yourself "Is the Copper market rigged?" before buying any more copper.

The price of electrolytic today for prompt and December shipment is around 34½ to 35 and for next year's shipment from 29 to about 32 cents. Lake is offered at 33½ for the first quarter and casting copper at 32½ to 33 cents.

Consumers of copper are really betting wildly that the war in Europe is going to last for another year. It may, of course, or it may not; and if there should be any sudden collapse on either side copper prices would surely break wide open and 15 cents might be reached before the market steadied again.

TIN

The price of tin in America has advanced about 4 cents per pound since the first of November due to the stoppage of permits in London and the consequent short supplies for America. London prices today are about £5 per ton below our parity and the present market is a risky one to handle. Consumption for the month has been very small and consumers are only buying for actual requirements. Prices today on five-ton lots spot are around 45¼ cents with futures offered about 1 cent lower.

LEAD

The Trust has stuck to its price of 7 cent New York basis all through the month although the price is entirely nominal and is only used as a settling. The Trust will not sell any lead even at 7.15 or 7.20. The actual market price for lead is made by the Independents and the price today is 7.20 to 7.25 New York carload lots. The Trust will have to advance its price before very long.

SPELTER

The spelter market has been active and prices have advanced about 3 cents per pound during November. The market is quiet towards the close of the month and the advance may be halted. New York price 13¼ cents and East St. Louis 13 to 13⅛ cents. Sheet zinc is up to 21 cents at mill.

ANTIMONY

The antimony market has been fairly active and prices have advanced about 1 cent per pound for the Chinese brand closing at around 14½ cents.

ALUMINUM

The aluminum market has been easier owing to freer offerings on prompt shipments and lower quotations on futures running over the first quarter of 1917. January has been sold at 63 cents and some export business was put through at 64 cents. Today there are sellers at 65 cents New York for virgino aluminum and very little inquiry.

SILVER

The silver market has been active and prices have advanced about 6 cents an ounce from 68⅛ at the opening to around 74 cents at the close.

QUICKSILVER

Market has been dull at $80 all the month with $75 per flask sellers at the close.

PLATINUM

The platinum market is firmer and prices advanced $25 an ounce from $80 at the opening to $105 at the close.

SHEET METALS

All copper prices are higher. Sheet copper is quoted at 41 cents base hot rolled and 42 cents cold rolled. Copper wire nominal prompt quotation is 40 to 41 cents base with January offered at 39¼. All brass prices are higher.

OLD METALS

The old metal market has held very firm owing to the advance in copper and spelter and prices are from 2 to 3 cents per pound higher than a month ago. There has been some good export inquiry for brass.—J. J. A.

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

Lake Copper. 1915—Average for year, 18.94. 1916—January, 24.75. February, 27.75. March, 28. April, 29. May, 29⅞. June, 28.25. July, 27.25. August, 27. September, 28. October, 28⅞. November, 32.25.

Brass Mill Spelter, 1915—Average for year, 17.50. 1916—January, 22.25. February, 22.75. March, 23.15. April, 23.20. May, 21.20. June, 17.40. July, 15.20. August, 13.60. September, 13.70. October, 12.95. November, 14.10.

NOVEMBER MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Closing.
Lake	34.00	28.35	33.50
Electrolytic	34.75	28.50	34.75
Casting	32.75	27.50	33.00
TIN	45.50	41.70	45.25
LEAD	7.50	7.00	7.35
SPELTER	13.35	10.50	13.35
ANTIMONY (Chinese and Jap)..	14.50	12.80	14.50
SILVER	74⅜	68⅛	74⅜

Metal Prices, December 4, 1916

NEW METALS.	Price per lb.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER.	
Manufactured 5 per centum.	
Lake, carload lots, nominal	33.50
Electrolytic, carload lots	34.75
Casting, carload lots	33.00
TIN—Duty Free.	
Straits of Malacca, carload lots	45.12½
LEAD—Duty Pig, Bars and Old 25%; pipe and sheets 20%. Pig lead, carload lots	7.35
SPELTER—Duty 15%.	
Brass Special	15.25
Prime Western, carload lots, nominal	13.25
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½ per lb.	
Small lots, f. o. b. factory	75.00
100-lb. f. o. b. factory	70.00
Ton lots, f. o. b. factory	66.00
ANTIMONY—Duty 10%.	
Cookson's Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	14.50
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot, Placquettes, Ingots, Blocks	45.00 to 50.00
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	$4.00
BISMUTH—Duty free	$3.60
CADMIUM—Duty free	nominal $1.80
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	$2.00
QUICKSILVER—Duty, 10% per flask of 75 pounds	$82.00
GOLD—Duty free, per ounce	$20.67
PLATINUM—Duty free, per ounce	$105.00
SILVER—Government assay—Duty free, per ounce	75⅛c.
*NICKEL ANODES—	Per lb.
85 to 87% purity	47½c.
90 to 92% "	50c.
95 to 97% "	52½c.

*These prices are quoted by request of nickel anode manufacturers.

INGOT METALS.			Price per lb.
Silicon Copper, 10%	according to quantity		45 to 50
Silicon Copper, 20%	"	"	45 to 50
Silicon Copper, 30% guaranteed	"	"	45 to 50
Phosphor Copper, guaranteed 15%	"	"	46 to 50
Phosphor Copper, guaranteed 10%	"	"	45 to 49
Manganese Copper, 30%, 2% Iron	"	"	45 to 50
Phosphor Tin, guaranteed 5%	"	"	60 to 65
Phosphor Tin, no guarantee	"	"	56 to 58
Brass Ingot, Yellow	"	"	21 to 23
Brass Ingot, Red	"	"	27 to 29
Bronze Ingot	"	"	27 to 29
Parsons Manganese Bronze Ingots	"	"	35½ to 37
Manganese Bronze Castings	"	"	32 to 42
Manganese Bronze Ingots	"	"	25 to 30
Phosphor Bronze	"	"	34 to 36
Casting Aluminum Alloys	"	"	46 to 48

PHOSPHORUS—Duty free, according to quantity.. 35 to 40

Dealers' Buying Prices.	OLD METALS.	Dealers' Selling Prices.
21.75 to 22.25	Heavy Cut Copper	25.00 to 25.50
20.50 to 21.50	Copper Wire	23.00 to 24.50
18.00 to 18.50	Light Copper	21.50 to 22.50
17.00 to 17.50	Heavy Mach. Comp	19.00 to 19.50
12.50 to 13.00	Heavy Brass	14.00 to 15.00
10.00 to 10.25	Light Brass	11.50 to 12.50
13.75 to 14.25	No. 1 Yellow Brass Turnings	14.50 to 15.25
14.25 to 15.00	No. 1 Comp. Turnings	15.00 to 16.00
5.00 to 5.50	Heavy Lead	5.75 to 6.00
6.50 to 7.00	Zinc Scrap	7.00 to 7.75
18.00 to 20.00	Scrap Aluminum Turnings	19.50 to 21.00
30.00 to 31.00	Scrap Aluminum, cast alloyed	32.00 to 34.00
40.00 to 42.00	Scrap Aluminum, sheet (new)	49.00 to 52.50
23.00 to 24.00	No. 1 Pewter	25.00 to 28.00
26.00 to 28.00	Old Nickel	30.00 to 32.00
19.00 to 21.00	Old Nickel anodes	22.00 to 24.00

PRICES OF SHEET COPPER.

Mill shipments (hot rolled) ..... 42c. base net
From stock ..... 44½c. base net

SIZE OF SHEETS.		64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Width.	LENGTH.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9		*	
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches	2	4	7						
	Not longer than 120 inches	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 8c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 3c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC—Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill ..... 21 cent basis, less 8%
Casks, jobbers' prices 22.00
Open casks, jobbers' prices 22½

Metal Prices, December 4, 1916

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect November 18, 1916.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.43	$0.44½	$0.47
Wire	.43	.44½	.47
Rod	.43	.45½	.48
Brazed tubing	.48	——	.52
Open seam tubing	.48	——	.52
Angles and channels	.48	——	.52

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.45	$0.46½	$0.49
Wire	.45	.46½	.49
Rod	.45	.47½	.50
Brazed tubing	.50	——	.54
Open seam tubing	.50	——	.54
Angles and channels	.50	——	.54

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

36c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	40c. per lb. base
100 lbs. to 300 lbs. in one order	40½c. " " "
Less than 100 lbs. in one order	42c. " " "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, — per lb.
Seamless Copper Tubing, — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛ ¼ ⅜ ½ ¾ 1 1¼ 1½ 2 2½ 3 3½ 4 4½ 5 6

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet— Brass.	Bronze.
⅜ inch		
½ inch		
⅝ inch		
¾ inch		
⅞ inch		
1 inch		
1⅛ inch		
1¼ inch		
1½ inch		
1¾ inch		
2 inch		

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	42c. net base
Muntz or Yellow Metal Sheathing (14" x 48")	38c. " "
Muntz or Yellow Metal Rectangular sheets other than sheathing	43c. " "
Muntz or Yellow Metal Rod	39½c. " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 65c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 7c. over Pig Tin. 50 to 100 lbs. 8c. over, 26 to 50 lbs. 9c. over, less than 25 lbs. 15c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Base price, 60c.

Gauge.	Width. Inches.	1 ton.	50 to 2,000 lbs.	Less than 50 lbs.
20 and heavier	3-30			
	30-60			
21 to 24 inclusive	30-48			
	48-60			
25 to 26	3-30			
	30-48			
27	3-30			
	30-48			
28	3-30			
	30-48			
29	3-30			
	30-48			
30	3-30			

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.	2½ in.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.																	
12.	.109.																	
14.	.083.																	
16.	.065.																	
18.	.049.																	
20.	.035.																	
21.	.032.																	
22.	.028.																	
24.	.022.																	

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

We are unable to quote these prices.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	48½c.	16%	53c.
8%	49½c.	18%	53½c.
10%	49¾c.	20%	55¼c.
12%	51½c.	25%	63c.
15%	52c.	30%	68½c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%	50c.	15%	58c.
8%	52c.	16%	58½c.
10%	54c.	18%	60½c.
12%	56c.	30%	76c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.

ALUMINUM COMPANY OF AMERICA

PITTSBURGH, PA.

ALUMINUM

SHEET TUBING
EXTRUDED SHAPES
ROD RIVETS WIRE
ELECTRICAL CONDUCTORS

Branch Offices

NEW YORK—120 Broadway
BOSTON—131 State St.
CHICAGO—1500 Westminster Bldg.
PITTSBURGH—2420 Oliver Bldg.
ROCHESTER—1112-1114 Granite Bldg.
CLEVELAND—950 Leader-News Bldg.
WASHINGTON—512-513 Metropolitan Bank Bldg.
DETROIT—1512 Ford Bldg.
PHILADELPHIA—1216-1218 Widener Bldg.
KANSAS CITY—308 R. A. Long Bldg.

ALUMINUM SHEETS

ROLLED TO YOUR SPECIFICATIONS
FROM OUR OWN MILLS
QUICK DELIVERIES

Write For Prices

Also Ingots, Alloys, Granulated Aluminum

UNITED SMELTING & ALUMINUM CO., INC.

NEW HAVEN, CONN.

Branch Offices { New York, N. Y. Detroit, Mich.

Plants { New Haven, Conn. Hamden, Conn.

PURE ALUMINUM
No. 12 ALUMINUM
No. 31 ALUMINUM
PATTERN ALUMINUM

INGOT · BAR · ALLOYS · GRANULATED · RODS
ALUMINUM

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., required by the Act of Congress of August 24, 1912, of THE METAL INDUSTRY, published monthly at New York, N. Y., for October 1, 1916.

STATE OF NEW YORK } ss.
COUNTY OF NEW YORK }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Thos. A. Trumbour, who, having been duly sworn according to law, deposes and says that he is the business manager of THE METAL INDUSTRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Palmer H. Langdon, 99 John street, New York; Editor, Palmer H. Langdon, 99 John street, New York; Managing Editor, L. J. Krom, 99 John street, New York; Business Managers, Geo. W. Cooper and Thos. A. Trumbour, 99 John street, New York.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent. or more of the total amount of stock.) The Metal Industry Publishing Company, 99 John street, New York; Palmer H. Langdon, 99 John street, New York; L. J. Langdon, 99 John street, New York; Thos. A. Trumbour, 99 John street, New York; John B. Woodward, 99 John street, New York.

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THE METAL INDUSTRY, THOS. A. TRUMBOUR, Business Manager.

Sworn to and subscribed before me this 17th day of October, 1916.
[SEAL]

O. B. LEWIS, Notary Public, Kings County Clerk No. 12.

Certificates filed: Kings County Register's No. 8014; New York County Clerk No. 54; New York Register No. 8076.
(Commission expires March 30, 1916.)

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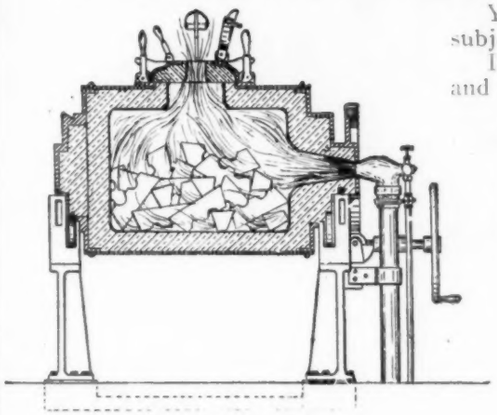

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You can dispense with crucibles in **some** cases. In **others**, the subject must be analyzed.

In the **majority**, on account of practical furnace construction and heat not impinging on metals, you can use

SIMPLEX and DOUBLE CHAMBER FURNACES

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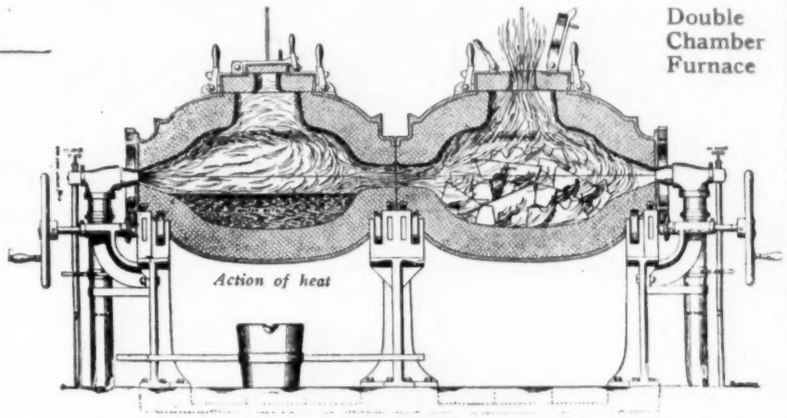

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The Metal Melts in One Chamber While the Heat Is Reducing the Metal in Other. Double Melting with Cost of One Heat.

The fuel equipment is inexpensive and out of the way, and in large melting propositions you can arrange for use of **Powdered Coal**, from a central distributing station. **No one furnace is a cure-all** for every melting proposition, **but** you can, **without charge**, call on us for advice and visit to your plant for practical suggestions and co-operation with view of placing your foundry on the **highest plane** of **efficiency**. Our men are divisible from operators in the foundry—Mechanical, Scientific, and Efficiency.

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No. 92—	500 to 700 lbs.
No. 93—	1000 to 1200 lbs.
No. 94—	2000 to 2500 lbs.
No. 95—	4000 to 5000 lbs.
No. 96—	6000 to 7500 lbs.

Double Chamber	Capacity per heat
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No. 2—	1200 " "
No. 3—	2400 " "
No. 4—	5000 " "

Reverberatory Tilting Furnaces—from 500 to 3000 lbs. per heat.

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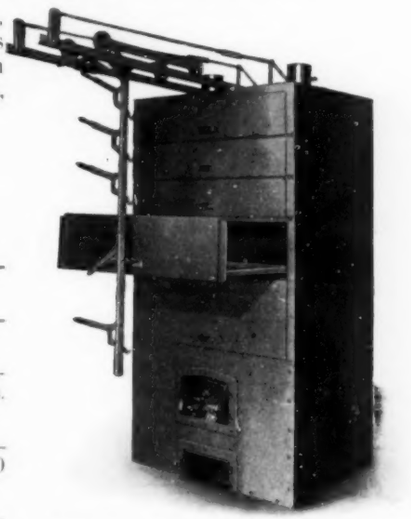

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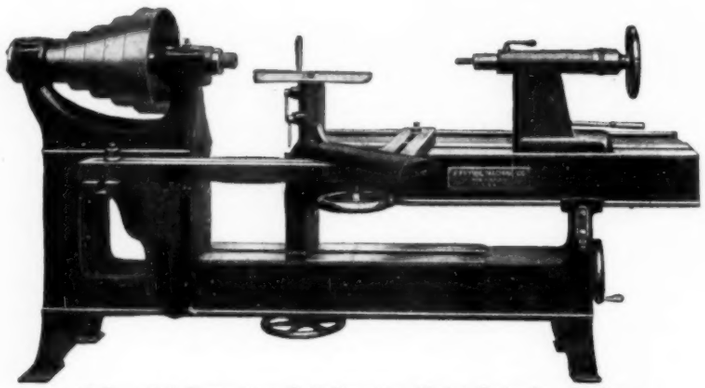

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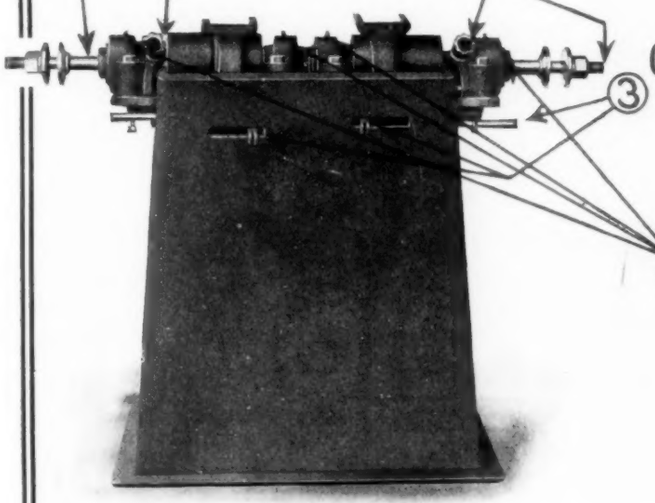

③ COMBINED SHIFTER & AUTOMATIC BRAKE stops spindle when belt is shifted to loose pulley

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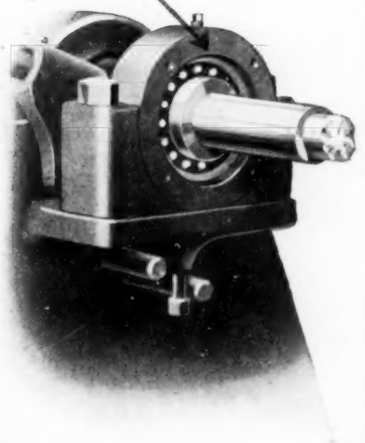
Will pay for themselves in one year

Write for list of satisfied users



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and 20 minutes time, total cost not over 35 cents

Saves Crucible worth $16.00

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PLEASE SHIP BY EXPRESS IMMEDIATELY ONE HUNDRED POUNDS HYTEMPITE

WITH FULL INSTRUCTIONS HOW TO USE.

DOMINION PRODS CO

On September 13th they placed an order for 100 lbs. for trial.

They repaired a new crucible broken in shipment (otherwise a complete loss) with HYTEMPITE and obtained 6 heats.

They went out to the dump, got a worn out crucible, patched it with HYTEMPITE and got 12 heats.

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HYTEMPITE ALSO ONE TON BY FREIGHT

DOMINION COPPER PRODUCTS CO

On October 5th they wired order for 225 lbs. by express and one ton by freight.

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TELEGRAM

291

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QUIGLEY FURNACE SPECIALTIES CO

26 CORTLANDT ST NYC

HAVE YOU SHIPPED BALANCE OUR ORDER HYTEMPITE NEEDED BADLY WIRE REPLY

DOMINION COPPER PRODS CO

On October 21st they wired to know when the ton lot was shipped, saying "HYTEMPITE needed badly." It is saving them money and they must have it. They, like hundreds of other foundries, have got the habit—HYTEMPITE must be kept in stock.

A letter from Canada on November 17 says:—

"One crucible repaired was a pot which has seen service and had SPLIT IN HALF (see cut). They put it together with HYTEMPITE and when I saw it yesterday it had gone 3 heats and looked like a new pot and ready for a few more heats.

Another crucible was BROKEN AT THE TOP (see cut) and the broken section was broken into two pieces. This crucible was repaired O. K. and had been used one heat and looks good for many more. In both cases the crucibles were old, worn out pots, which had seen service and by being repaired they saved the company the price of a new crucible."

Use HYTEMPITE for bonding new furnace linings, for making rammed up furnace linings, patching old linings, etc., etc.

QUIGLEY FURNACE SPECIALTIES CO.

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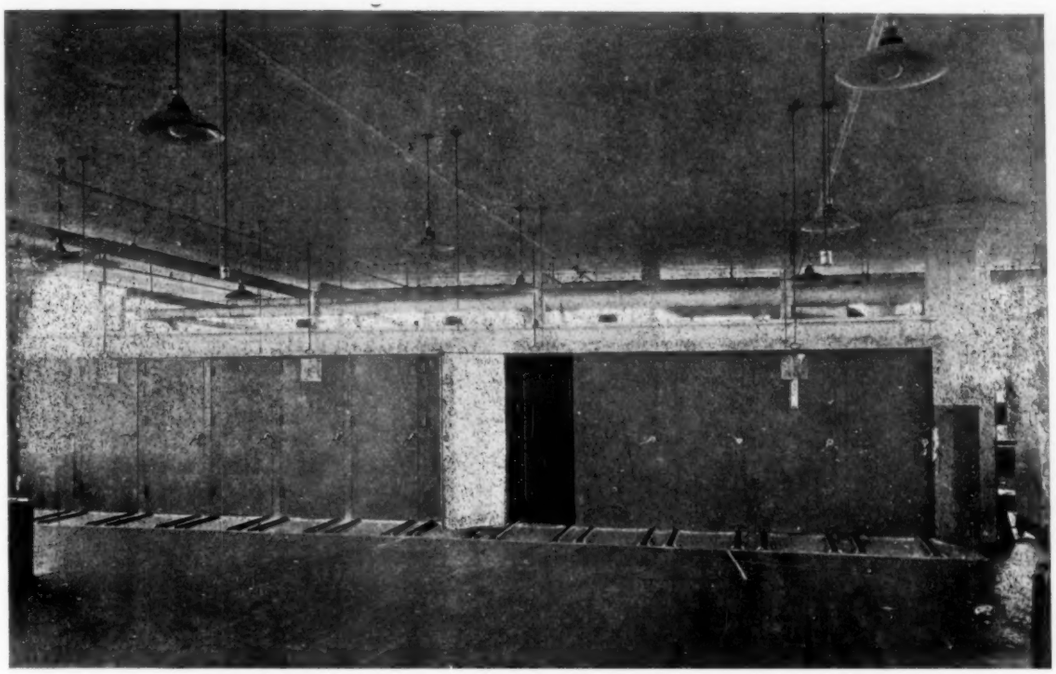


Enameling ovens insulated with Nonpareil Insulating Brick. The Elwood Myers Co., Springfield, O.

The Foremost Concerns in the Country Use Them

It is said, "A man is known by the company he keeps." By the same token, then, is it not also true that the worth of a product is shown by the kind of people who use it? Such being the case, a glance through the list of those using

Nonpareil Insulating Brick

For Furnaces, Blast Mains, Boiler Settings, Etc.

will indicate their merit at once. Most of the big, successful manufacturers of the United States, such people as

Bethlehem Steel Company
Republic Iron & Steel Company
Zenith Furnace Company
Remington Arms Company
Harrison Brothers Company
Roessler-Hasslacher Chemical Co.
Hooker Electro Chemical Co.
Westinghouse Electric & Mfg. Co.
General Electric Company
The Texas Company
Grasselli Chemical Co.

and others have not only used Nonpareil Brick in the past, but many of them are sending repeat orders constantly. Isn't this pretty good evidence that Nonpareil Brick pay a profitable return in heat saved and improved operation of high temperature equipment?

A sample Nonpareil Insulating Brick and full information as to how they will save money in your plant, will be sent, free of charge, on request.

Armstrong Cork & Insulation Co., 116 Twenty-fourth Street PITTSBURGH, PA.

Also manufacturers of Nonpareil High Pressure Covering for steam lines, and Nonpareil Cork Covering for drinking water systems.

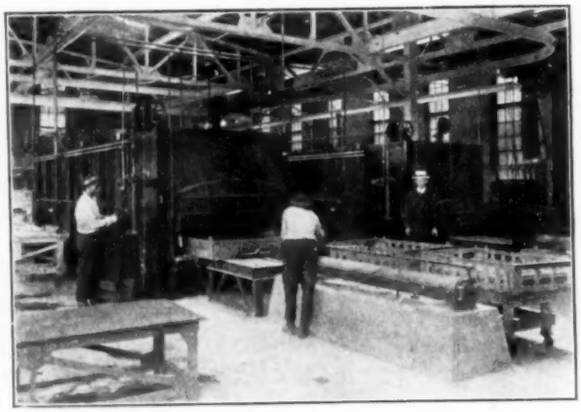
TAYLOR CRUCIBLES

For Years the Recognized
Standard
for Uniform Service

IF INTERESTED, WRITE US

ROBERT J. TAYLOR, Incorporated
1900 to 1916 Callowhill Street, PHILADELPHIA, PA.

Accurate Temperature Over-Fired Heat-Treating Furnaces



FOR annealing brass products between drawing operations. CONTINUOUS TYPE—large production. Doors are provided at both ends of the furnace. The material to be annealed is brought to the furnace in pans by means of a Telfer track, the pans are pushed through the furnace mechanically, come out at the other end annealed perfectly, go to the cooling bed, are quenched, then proceed to the next operation, only one man being required to carry the material to and from the furnace.

Send for Descriptive Bulletin—*New Edition.*

Metals Production Equipment Company

Successors to Quigley Furnace & Foundry Company

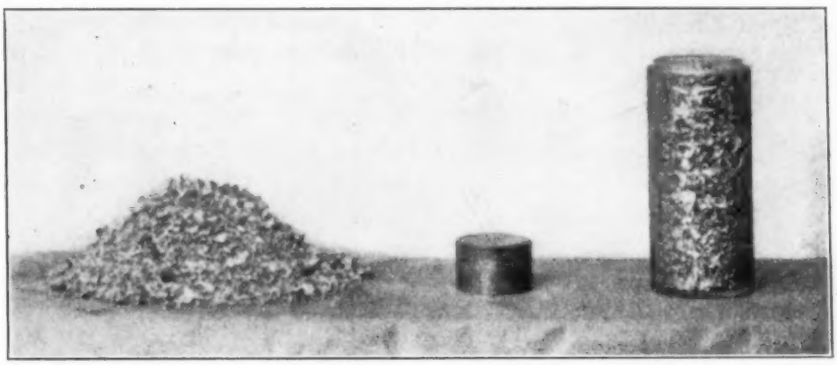
Sales Offices:

105 West 40th St., New York — First National Bank Bldg., Chicago

Works: Springfield, Mass.

Designers and Builders of Accurate Temperature Over-Fired and Forge Furnaces (Oil, Gas and Coal Fuel). Grey Iron Castings. Powdered Coal Equipment. Brass Rolling Mill Products.

MELTING DOWN CHIPS
AND LIGHT SCRAP
FLINGS $ DOLLARS $ IN THE AIR
PRESS YOUR CHIPS INTO



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(Ronay Process)
and the dollars stay with you!
THE GENERAL BRIQUETTING COMPANY, 25 Broad St., New York
TELEPHONE "491 BROAD"

OUR
IMPORTED CRUCIBLES
ARE AVERAGING 18 HEATS ON CUPRO-NICKEL

Satisfied customers' repeat orders largely caused this rapid increase of sales.
There Is A Reason.

$210,000	November
$125,000	October
$75,000	September
$55,000	August
$20,000	July

Remember—the price per number is only one factor of real or final crucible cost

Niagara Falls [Ont.] G. & P. Co., 50 Church St., New York
Telephone "Cortlandt 2799" Room 1854

FOUNDRYMEN ATTENTION!

OWING TO THE HIGH PRICE and poor quality of crucibles furnished at the present time, with no immediate prospects of lower prices or better quality, the crucible question has become a very serious matter in the foundry today.

WE HAVE SUCCEEDED IN OVERCOMING, to a large extent, the poor service obtained from the crucibles now furnished, by the use of our GRAPHITE LIQUID PREPARATION, which has shown a marked increase in crucible service.

IN ONE PLANT with eleven crucible furnaces, running three heats daily, only one crucible flaked, and that very slightly in the first heat. These eleven crucibles averaged, when last heard from, thirty-two heats each, and were still running.

BY THOROUGHLY COATING with GRAPHITE LIQUID PREPARATION and exercising the usual precautions in properly annealing and starting the crucible in a slow fire on first heat each morning, the perplexing crucible troubles will be largely solved.

The Hanson & Van Winkle Co.

MAIN OFFICE AND FACTORIES
269-271 Oliver Street, NEWARK, N. J., U. S. A.

ESTABLISHED 1820.

81 Walker Street, NEW YORK.
842-846 West Erie Street, CHICAGO, ILL.
SAN FRANCISCO, Agency, 268 Market Street.

CANADA OFFICE: Canadian Hanson & Van Winkle Co., Limited, Morrow Ave., Toronto, Ont.

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OF QUALITY

JONATHAN BARTLEY CRUCIBLE CO.
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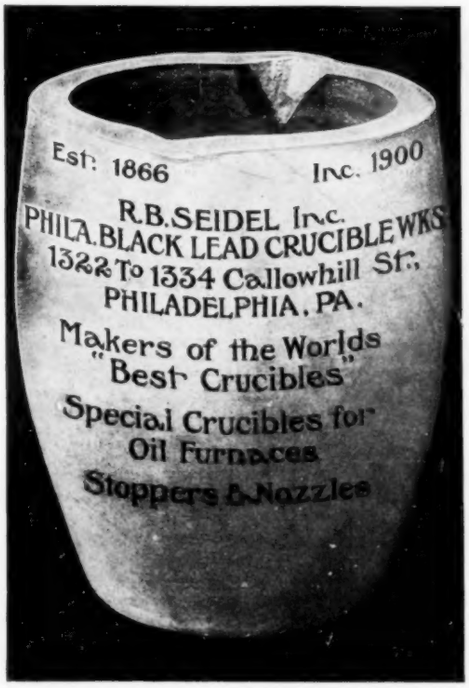


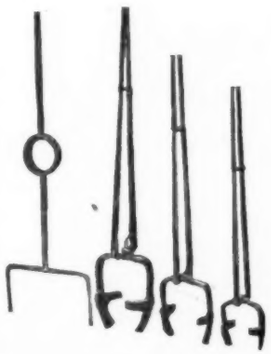
OUR catalogue is made up of bulletins devoted to various subjects, in connection with

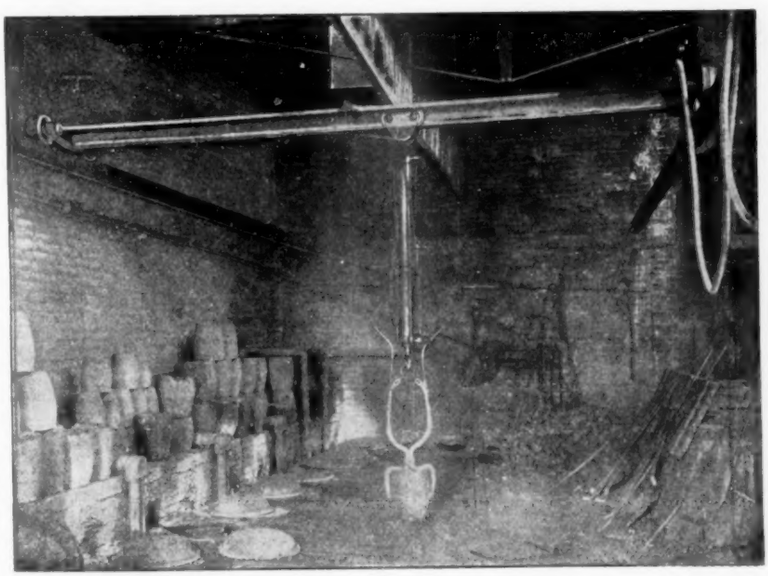
Foundry Equipment

and we would like you to have them either separately or collectively in a binder. Will you write us?

J. W. Paxson Co., Mfrs.

1021 No. Delaware Ave. Philadelphia, Pa.





WE SPECIALIZE ON

Cranes	Sand Blast Mach'y	Elevators
Cupolas	Water Cinder Mills	Overhead Tramrails
Ladles	Core Oven Equipment	Sand Sifters
Converters	Air Hoists	Brass Furnace Equipt.
Tumblers	Trucks and Cars	Watters Grab Buckets
Dust Arresters	Turntables	Malleable Furnaces

Brass Foundry Equipment

Complete plants designed and equipped, including furnaces, pit gratings, crucible tongs (for use by hand or crane), crucible shanks, pick-up tongs, tumblers, and air hoists.

Take advantage of our long experience in designing and equipping brass foundries.

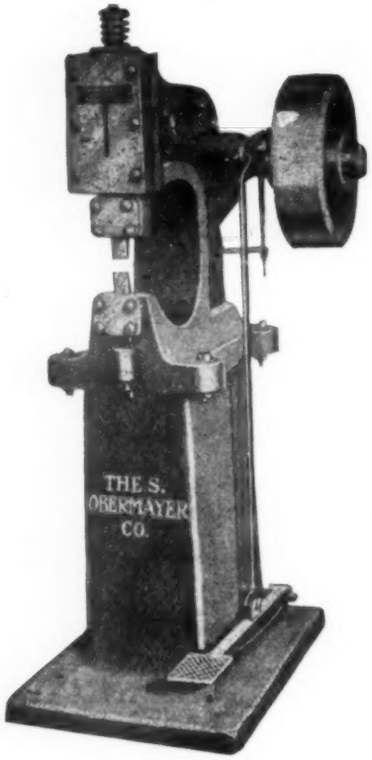
SEND FOR CATALOG NO. 123

COMPLETE FOUNDRY PLANTS

Designed, equipped and put into operation

CRANES OF ALL KINDS

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB



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TRADE MARK REGISTERED

Non-Ferrous Metal Foundries Completely Equipped and Supplied. Everything in Stock

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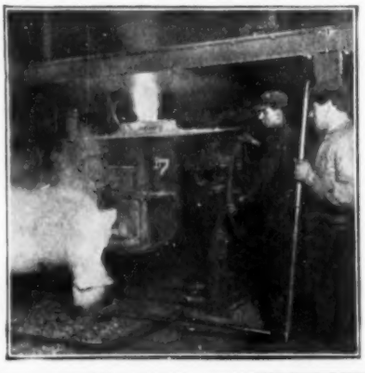
CHICAGO CINCINNATI PITTSBURGH ST. LOUIS
Established 1874



Tilting Reverberatory Furnaces
for Non-Ferrous Metals
(Melting without Crucibles)

For full description write for Catalog No. 22-A

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Furnace Engineers and Contractors
50 CHURCH STREET NEW YORK
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W. S. ROCKWELL CO. INDUSTRIAL FURNACES ESTABLISHED 1888 50 CHURCH ST. NEW YORK

MONARCH CINDER MILL
IDEAL CRUSHER AND PULVERIZER
ROTARY MIXERS
For Gold and Silver Refiners, Brass Foundries, Etc.
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SAND-BLAST MFG. CO. INC
MACHINES - ALL TYPES
INSTALLATIONS DESIGNED
CHICAGO NEW YORK
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The Goggle you will eventually purchase
FOR THE PROTECTION OF YOUR WORKMEN

No. 387—Especially adapted for foundry room.
Eye Shields, Eye Shades, Auto Goggles.
Send for Catalog M-I.
CHICAGO EYE SHIELD CO.
130 South Clinton St., Chicago, Ill.

WADSWORTH QUALITY

COMPLETE CORE ROOM EQUIPMENT

Stock Core Machines, Cutting Off Machines, Coning Machines, Core Ovens
Compounding and Sand Mixing Mills, Compounding and Sand Crushing Mills
Jar-Ramming, Roll Over, Box Lifting, Core and Molding Machine
Standard Core Prints, Core Print Cabinets, Core Testing Machines
Rumbling Barrels, Air Cooled Gagger Molds
"Never-Break" All Steel Core Trays and Bottom Plates

BRASS FOUNDRY EQUIPMENT

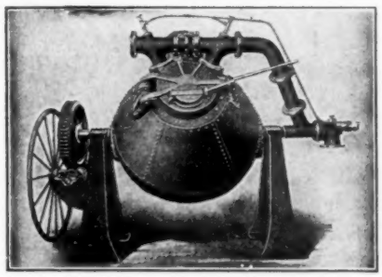
We have equipped some of the largest foundries in the country

Send for Catalog "M" and let us know your wants and we will gladly give you further information.

THE WADSWORTH CORE MACHINE AND EQUIPMENT CO.

AKRON, OHIO, U. S. A.

Hawley-Schwartz Furnaces



No. 2, 42" Cauldron

Extract from a letter from one of the largest Foundries in the United States:

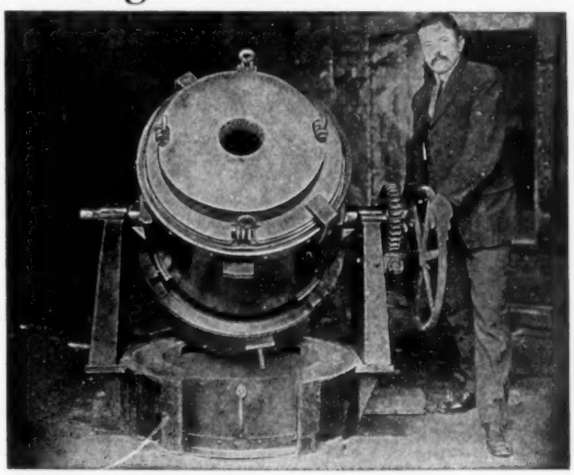
"We are always glad to do anything we can to change the erroneous impression that a number of small brass foundries have that the best way to get a high grade metal is by means of melting a number of small charges in separate crucibles and mixing them in a ladle. We do not have any crucible equipment in our plant at this time, and do not propose to install any, having discarded our entire crucible outfit in favor of the Hawley-Schwartz Furnaces."

(Name given on application.)

The Hawley Down Draft Furnace Co.

Easton, Penn., U. S. A.

"Ideal" Tilting Crucible Furnace



For Melting Iron, Copper, Brass, Bronze, Aluminum, Etc.

Also a **Complete Line of Gas and Oil Fired Furnaces,** including **Rotary Melting Furnaces** with capacity from 250 lbs. to 4,000 lbs.

Also **Annealing, Rivet-Heating, Heat Treating, Forge Furnaces,** Lead Pot Furnaces, etc.

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IDEAL FURNACE CO., Chester, Penna.

Phone Bell 1249

Every Person Interested In Expert's Report On Boron-Co

Patents Pending

BETTER THAN OR ON BG OLD STANDARD GOLD TRADE MARK

Mr. R. A. Wood, publisher of The Waterbury Book of Alloys, who is interested in trying out new alloys with most critical tests before publishing them in his book, has given the following *unsolicited testimonial* on BORON-COPPER in his letter of October 16th, 1916, in which he adds:

Cheshire, Conn., October 16th, 1916.

I am enclosing copy which I am getting ready for my book. Would you be kind enough to look it over? If you desire, you are at liberty to use all or any part of it before I publish it, as my printer, like everybody else, is way behind in his work.

I hope to be able to try out your other samples soon, but cannot tell definitely just when at the present moment.

Sincerely yours,
R. A. WOOD.

By R. A. WOOD

The use of boron as a deoxidizing agent for copper and its alloys bids fair to fill a long felt want in the metal trades. It does not require a specialized metallurgist for its successful manipulation, but it may be handled by the ordinary melting crew, along with the use of the customary fluxes (such as salt, charcoal, borax, etc.), and without any special training of the men.

Numerous fluxes have been placed upon the market, from time to time, having more or less value as deoxidizing agents, but with few exceptions (outside of the common fluxes established by custom) their life has been short; their chief drawback has been that they, by continued use, introduced an over-abundance of impurities into the metal or, in order to obtain the required result, the method of their application was too complicated and time-consuming for the ordinary melter to bother with. Boron, fortunately, owing to the simplicity of its action upon the molten metal, obviates these difficulties.

My first experience with boron as a flux was with some 10% German Silver. BORON-COPPER was the medium used for its introduction to the molten metal. Owing to certain unavoidable conditions it became necessary to make the 10% German Silver out of all scrap and an all-scrap mixture made of the nickel alloys presents a serious problem to the melter.

The scrap used was clippings from spoon and fork blanks returned to the mill from the manufacturer and it was melted down in crucibles holding 210 pounds of metal. The melting was done in the usual manner under a covering of charcoal and borax and at the first signs of melting, 4 pounds of BORON-COPPER were added to the mixture. The metal was brought up to a high temperature (3200-3300 deg. F.) and well stirred, after which it was cooled down to its pouring heat and poured into cast iron molds 6½" wide and 1⅛" thick.

The bars were rolled down without previous annealing to ½" in thickness without showing any edge cracks. They were then annealed in the usual manner and rolled down to their finished thickness. The final inspection of the finished material showed a smaller percentage of scrap than was the case when all new metal was used for the mixture without the use of the BORON-COPPER.

Such good results were obtained with the 10% scrap that the same method was tried with 15%, 18% and 21% German Silver scrap and in each instance satisfactory results were obtained. The amount of BORON-COPPER used was later cut down to 2 pounds per crucible without changing the ultimate results.

A batch of scrap turnings from shrapnel shells was next tried (67 Cu. 33 Zn. mixture) and this metal, after being finished in the rolling mill, passed inspection for surface and all chemical and physical requirements called for in the contract from the ammunition makers. In this instance 1½ pounds of BORON-COPPER was used for 210 pounds of metal.

In the next test it became necessary to get out very quickly a sample lot of cartridge gilding (95 Cu. 5 Zn. mixture) and there was nothing on hand to make it from but some scrap from sheet copper which had been rolled down to .003 and .005 (three-thousandths and five-thousandths of an inch) in thickness and some Horsehead spelter.

The first melt was made by using charcoal, salt and borax as fluxing agencies and the usual precautions were taken in melting. The resulting bars were without exception dirty and porous. In the next heat 1% of BORON-COPPER was first placed in the bottom of the crucible and the scrap copper on top of it.

AMERICAN BORON PRODUC

(SOLE MANUFACTURERS

National Alloys Limited, Lond

Metals Ought to Study This pper As A Deoxidizing Agent

A couple of handfuls of common salt were thrown into the crucible when the copper started to melt, and the charcoal was not added until the whole of the copper had become melted and just previous to the addition of the spelter to the molten metal. Each bar showed a good, clean and sound casting had been obtained.

These bars were rolled down to ½" in thickness before annealing. They were then overhauled and rolled down to 1/16" in thickness, after which they were again annealed and rolled to .018, which was the finishing size. No edge cracks developed during the rolling of the metal and the amount of scrap produced upon final inspection was less than the average when new metal was used for the mixture.

The above examples show the wide range BORON-COPPER has as a deoxidizing agent and the ease with which it may be handled by the ordinary foundry help.

Patented

Note Carefully: The particular number used by Mr. Wood was BORON-COPPER ALLOY (Number 3 of the list of BORON PRODUCTS manufactured by this Company). The best results are always obtained by advising as to the use to which our products are put.

Below is a **List of Boron-Products** manufactured by American Boron Products Co., Inc., Reading, Pa.

These products are made in shot form of various sizes, from A (the finest) to E sizes.

Number	Name of Product	Price List	Discount	Net Price per lb. Subject to change without notice.
1	BORON-ALUMINUM	$2	55%	90c per lb.
2	BORON-COPPER ALLOY	1	47½%	52½c " "
3	BORON-COPPER ALLOY	1	47½%	52½c " "
4	BORON-COPPER "F" 3½	1	47½%	52½c " "
5	BORON-COPPER "F" 5	1	47½%	52½c " "
6	BORON-COPPER ALUMINUM 5	1	35%	65c " "
7	BORON-COPPER ALUMINUM 10	1	30%	70c " "
8	BORON-COPPER NICKEL 5050	1	35%	65c " "
9	BORON-COPPER "L"	1	35%	65c " "
10	BORON-COPPER PLASTICS 5050	1	65%	35c " "
11	BORON-COPPER PLASTICS 2575	1	74%	26c " "
12	BORON-NICKEL	2	55%	90c " "
13	BORON-COPPER "PM"	1	40%	60c " "

NOTE CAREFULLY: In every case where BORON PRODUCTS are ordered, it will be well to outline the specific purpose for which the particular number is ordered.

No. 1—Used for deoxidizing. Aluminum Bronzes of great strength and density produced with B. Al. For hardening and strengthening Al. castings; For alloying with Alum. products generally.

No. 2—Used for deoxidizing and alloying. For solid castings of all kinds. For strengthening iron and steel and improving all metals "from gold to steel."

No. 3—For deoxidizing, toughening and purifying brasses and bronzes and for entering lead in same. For solid copper castings of low conductivity.

No. 4—Same as No. 3, but for high conductivity.

No. 5—Same as No. 4, but for producing tougher product with high conductivity.

No. 6—BC-Al. will greatly improve aluminum and aluminum castings and bronzes. For making solid steel ingots and castings, greatly increasing ductility and tensile strength, as well as improving the machining qualities.

No. 7—Same as No. 6, but stronger.

No. 8—For Nickel Steel, saving one-half of the nickel content usually used and producing a better product.

No. 9—For uniting copper and lead. The best product known for uniting copper and lead in any proportions and for producing the highest grade of anti-frictional bearings. 50% copper and 50% lead perfectly united by this method.

No. 10—The finest anti-friction product to be found anywhere.

No. 11—Same as No. 10, but higher in lead (excellent for gaskets used in super-heated steam).

No. 12—Far better than commercial nickel for all purposes where nickel is used.

No. 13—Specially adapted for improving manganese bronzes and products containing manganese generally.

TS COMPANY, Inc., Reading, Pa.

AND DISTRIBUTORS)

on, England. Foreign Distributors

For Foundries, Use

NON-METALLIC FLUX

Its qualifications are:—

Thorough fusion of the alloys, which is the most important factor in mixing metals for casting purposes, assuring added strength and elongation, reducing oxidation, which eliminates skimmings to a minimum and prevents absorption of oxygen, insuring sound castings free from porousness. The melting point is shortened by its use. It prevents slag and the metal from cleaving to inside of crucible, thereby adding to the life and efficiency of the crucible.

The quantity to be used is from $\frac{1}{4}$ to $\frac{1}{2}$ pound of Flux to the 100 lbs. of metal, and can be used when melting any of the following:—

Brass or composition, pure aluminum, aluminum and zinc mixture, German silver, nickel, etc.

We can also furnish special mixture for galvanizing, solder, stereotype, linotype metal or white metal.

The Hanson & Van Winkle Co.

MAIN OFFICE AND FACTORIES
269-271 Oliver Street, NEWARK, N. J., U. S. A.

ESTABLISHED 1820.

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TURNER MACHINE CO.

3632 North Lawrence Street
PHILADELPHIA, PA.

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TURNER PATENT SPRUE CUTTER
WITH BELT DRIVE
Strong, rigid, durable; large capacity, good adjustment, good frame.

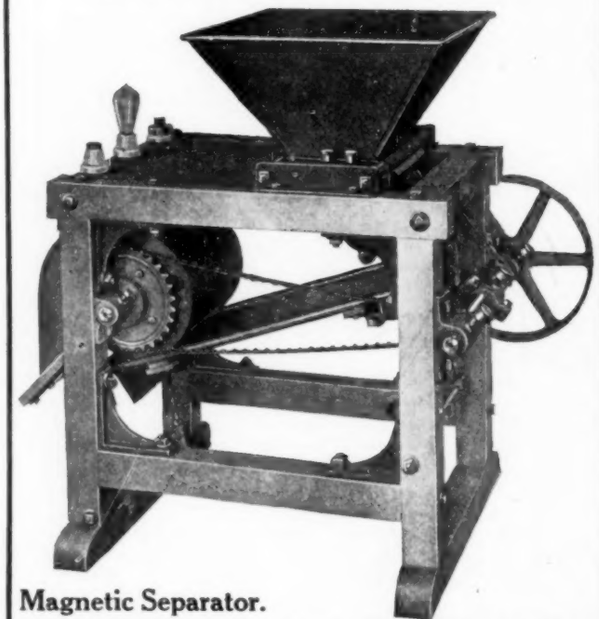
TURNER PNEUMATIC MOLDING MACHINE
Designed especially for brass foundries making plumbers' and electrical goods, etc. Built in three sizes.
Our hand Power Molding Machines are highly regarded in numerous large foundries. This new pneumatic type is even better.

AUTOMATIC COCK GRINDER
With one operator will grind 400 ¾-inch cocks per day.

SAND SIFTER AND MIXER
Made with single or double heads. Requires only ½ horsepower. Soon pays for itself.

If It's Capacity and Efficiency You Are Looking for, Then Try a

MODERN



Magnetic Separator.

MAGNETIC MANUFACTURING CO.
Enterprise Bldg., Milwaukee, Wis.

C. M. Miller.

Radioclarite for Bronze
Keystone Thermo Flux for Grey Iron
Ferroclarite for Malleable Iron and Semi-Steel

In these strenuous times when minerals are scarce and war prices are being demanded do not forget the MILLER FLUXES.

KEYSTONE THERMO TITANIUM FLUX for GREY IRON and ALL FERROUS METALS is a great saver of Iron and Coke. We do not question any Coke offered for sale in a Foundry. We take it as it comes and improve your product. We do not meddle with your Foundry practice. You will find that it is less trouble to use the Flux than not to use it. There is no place this Flux will not save its cost ten times over.

What we say of our Iron Flux, we also say of our RADIOCLARITE for BRASS, BRONZE and all NON-FERROUS METALS. It will give you every quality you have been looking for in Bronze. The largest melters of Bronze in the world use RADIOCLARITE. It is now being used extensively in the manufacturing of shrapnel and other war material.

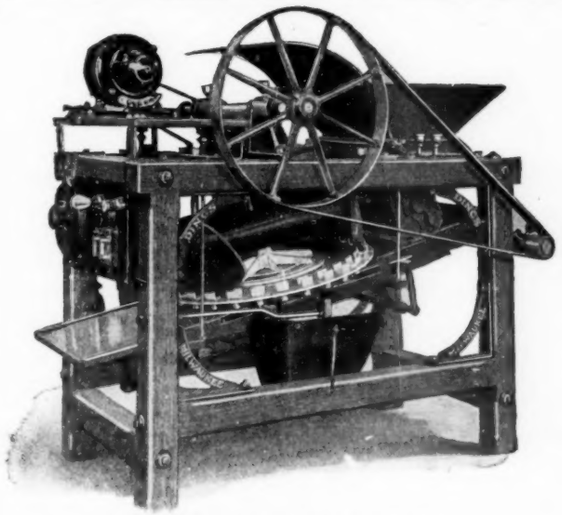
Try our PEARLITE for ALUMINUM and our special brand of RADIOCLARITE for COPPER. It is the one thing that will make solid copper castings.

Keep progressing! You may have perfection today, but tomorrow the other fellow will catch up with you, if you do not keep on the job. Get good Castings every time by using our Fluxes. Send for a trial order. WE ASK NO PAY UNLESS THE FLUXES PROVE SATISFACTORY AFTER TRIAL. Beware of counterfeit and imitation Fluxes. Get the original.

The Basic Mineral Co.

Box 276 N. S. Pittsburgh, Pa.

Magnetic Separators



No. 2 Type "M" with Generator

2000

Now in Successful Operation

Ask us to send you a List of Satisfied customers in your Locality

Why Experiment

DINGS MAGNETIC SEPARATOR CO.

671 SMITH STREET MILWAUKEE, WIS.

Woodseed Liquid Core Compound

can be depended upon to give the results required of Linseed Oil, and it costs you less. We stand ready to prove this by sending you a barrel to your plant on trial. Don't pay for it until you are satisfied. Send in your order now!

WOODISONS' "QUALITY" PARTING

The L. & A. Electric Vibrator

is still rapping its way to National Popularity. No parts to get out of order. Consumption of power is a negligible factor. We send it on thirty days' trial. You've read about it—now order it and be sure to specify the Voltage, Cycles and Phase of your current.

is manufactured in our plant of carefully selected materials best adapted to give desired results.

It is equally efficient on Molds where Patterns have shallow or deep lifts.

It is light in color, and absolutely impervious to moisture, and a light dusting on the Mold will result in a perfect part.

Lycopodium is hard to obtain and very expensive—Quality Parting can be shipped immediately and is economical.

We will send a barrel on trial to you now. May we?

We Manufacture Perforated Tin Chaplets.

No. 114 Tripoli Composition

is a moderately fast cutter that has met with success on jobs that are "Particular." It will reduce your cost materially by combining the operations of cutting and coloring. The most successful polishers have confirmed this assertion by sending us repeat orders. How about you?

The E. J. WOODISON COMPANY

FIRE BRICK
FOUNDRY REQUISITES
Platers' and Polishers' Supplies.

HOME OFFICE: DETROIT, MICH.

BRANCHES

Boston
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St. Louis
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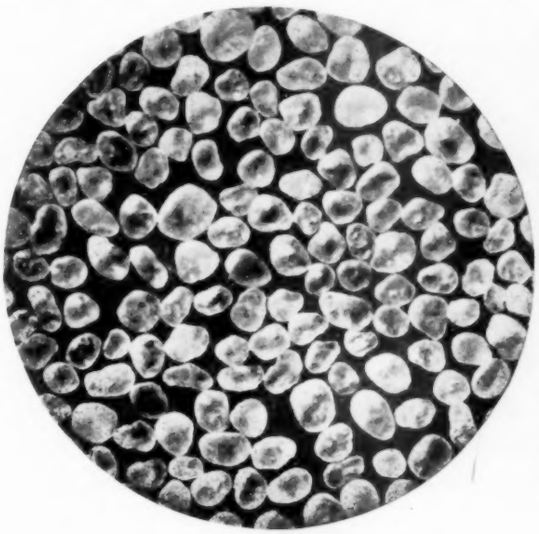
K K K Kuick Koloring Komposition

is a first-class material for coloring brass, bronze and copper before it goes to the plater. It can also be used on Oxidized Copper work, on the operation called spotting, and for coloring aluminum. It will not smut the metal, and will give that rich, brilliant lustre you are after. Ask for Sample!

We Made a Terrible Mistake
in Last Month's Ad.

A green clerk sent the wrong cut along with the copy—and it was printed:

So, instead of showing the beautiful round, uniform, pearly-white FLINT SHOT at the head of our ad we showed the ugly mess of all sorts and sizes of pebbles that the microscope reveals in Ocean Sand.



FLINT SHOT
The Cut We Should Have Sent.

OCEAN SAND
The Cut We Did Send.

See the difference for yourself—right here—

We hope this mistake will not lead any of our friends in the Metal Industries to a wrong conception of Flint Shot.

And to make amends for our mistake, we now offer to send Free, Freight prepaid, a 150 lb. bag (or more) of Flint Shot to any reader of Metal Industry who operates Sand Blast apparatus.

FLINT SHOT is not Sand, but a collection of round nodules of pure flint which we separate from St. Peter's Rock by mechanical processes; then wash, dry and screen to size.

FLINT SHOT looks like a bag of very small pearls. It is finer than ordinary Sand Blast Sand; a great advantage because the treated surface gets **more impacts** per square inch, and the fineness of the Flint Shot gives a smooth velvety finish that is impossible with ordinary sand. More impact also means faster work.

FLINT SHOT also outlasts ordinary sand many times over, because it is so exceedingly hard—and has no lines of cleavage.

This means a big saving in **freight,** because you will make one car of Flint Shot go as far as two or three cars of ordinary sand.

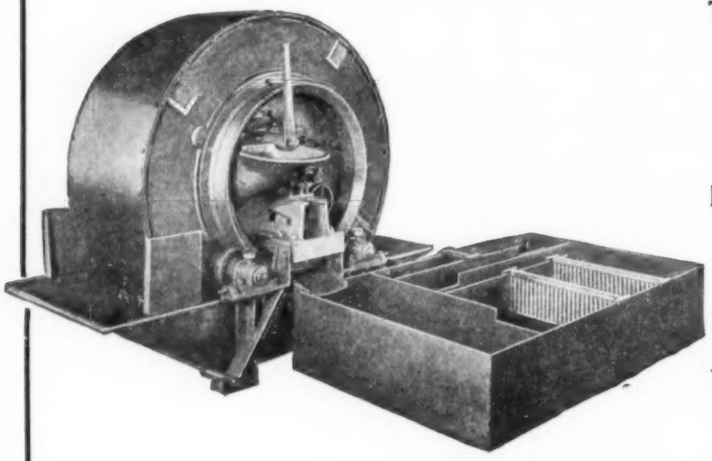
Send for our Flint Shot booklet

U. S. SILICA CO.

122 Michigan Avenue **Chicago, Ill.**

The Standard Crusher and Pulverizer

was put on the market as a distinct advance in crusher design and construction. Time has completely vindicated this, the first application of correct principles to the crushing and pulverizing of foundry wastes.



THE STANDARD has made good for many others—it will make good for you, saving you power, labor and water and recovering 99% of all metal contained in the ashes or residues you run through it.

Having the best, in fact the only correctly designed crusher on the market, it would be bad business to spare any expense on its construction, so we make the STANDARD strong and durable at every point.

You can try out a STANDARD in your own shop on 10 days' approval.

Catalog "SC" gives further particulars

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From Foundation to Flag Pole
We Know Foundries

Our Consulting and Engineering Department—a thoroughly prepared and comprehensive organization of proved efficiency—will study your requirements, big or little, for a single machine or for complete equipment *including the building itself.*

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Every Metal Shop Should Have —

Our Catalog "SB"

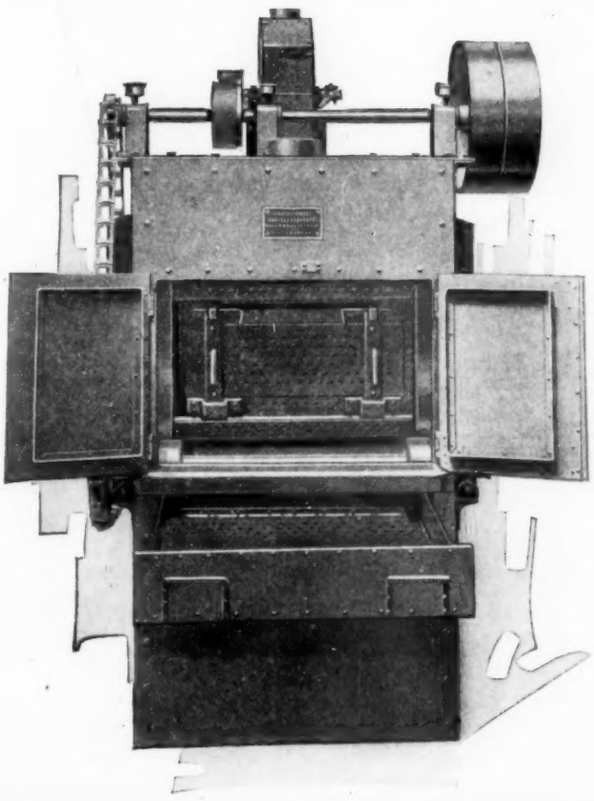
which describes the NEW HAVEN SAND BLAST BARREL—the only genuine self-contained Sand Blast Barrel wherein the operations all take place inside the drum. The sand or other abrasive material does not leave the inside of the barrel, but is used over and over again until worn out. The gears, bearings, etc., being on the outside, are kept free from dust. The dust and dirt from the castings cannot escape into the air, but are removed from the barrel by direct exhaust. This valuable feature is found only in the NEW HAVEN barrel.

The NEW HAVEN is "built up to a standard" not "down to a price." In design, it is mechanically correct. In construction, it is strong, durable, capable of withstanding all strains likely to be put upon it.

Try it out on approval.

Send for Catalog "SB"

THE NEW HAVEN SAND BLAST CO., NEW HAVEN, CONN.



OUR Revolving Barrel Sandblast Machine is dustless, automatic in its operation and consumes less power and air than any barrel of like capacity on the market.

It is ready to run. Simply apply power and turn on the air. No pits required, the machine sets on the floor level.

A few operators are the following: Standard Sanitary Mfg. Co., W. D. Allen Mfg. Co., Bastian-Blessing Co., American Bronze Co., Faunt Bros., Findeisen & Kropf Mfg. Co.

Brown Specialty Machinery Co.

2426 W. 22nd Street **Chicago**

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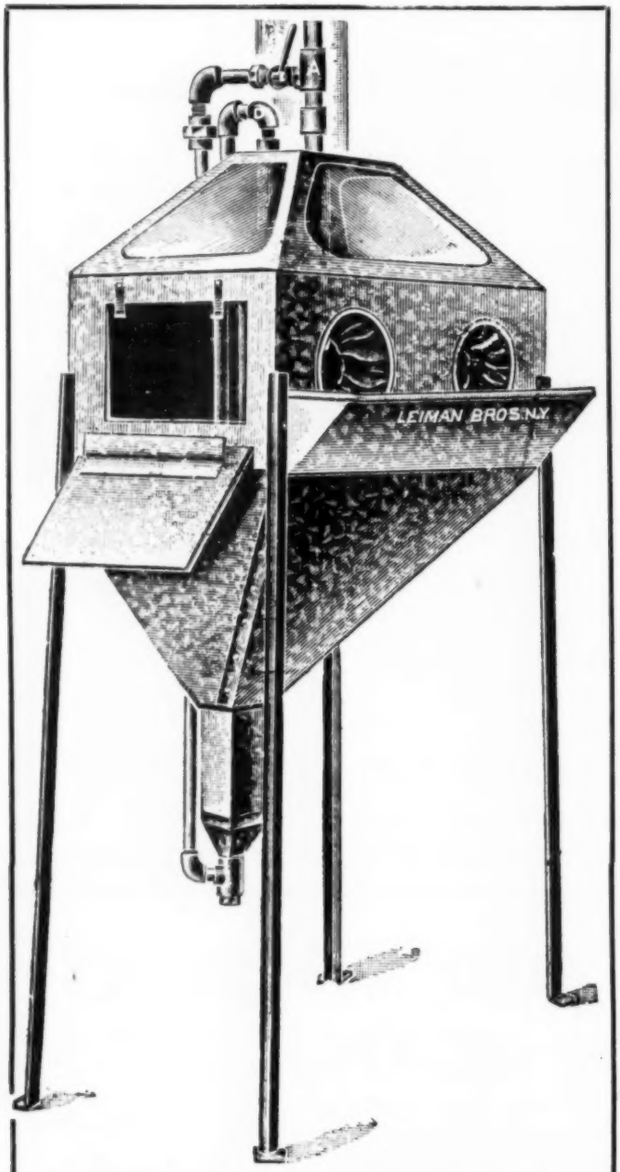

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SAND BLAST

uses the same sand over and over again continuously —anyone, however inexperienced, can operate this machine without hesitation—it is so simply constructed. Sand blasted articles are quickly plated—castings cleaned quickly—letters and designs stenciled on glass or metals, or completely frosted—any degree of finish, whether fine or coarse.

THIS IS THE STANDARD SAND BLAST OF THE MANUFACTURING WORLD

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All the Advantages of a Turret Lathe at a Trifling Cost. In 15 seconds you can change your engine lathe into a practical turret lathe, thereby doubling production and effecting surprising economies, by attaching a NEWMAN Multiple Rotary Chuck to the tailstock. Bores, Reams, Taps, etc., without changing tools. **Sent free for 30 days' trial to responsible concerns.** Write for Bulletin M. I. T., describing this and other tools.

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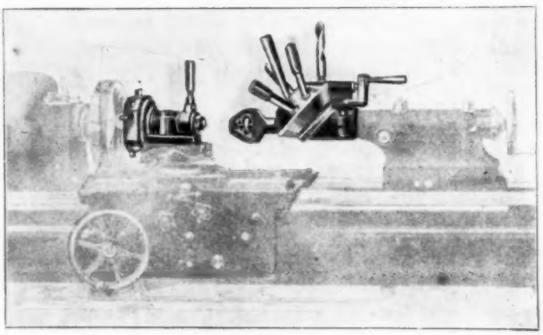

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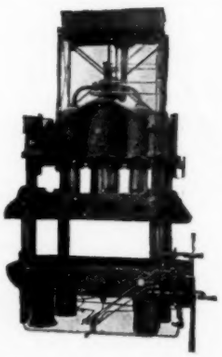

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makes the wire **perfectly straight** and cuts it to accurate lengths.

Requires only part of the time of unskilled labor to operate this Automatic Wire Straightening and Cutting Machine, therefore costs little to run and pays for itself in a short time.

Many sizes, and Catalogue gives more information.

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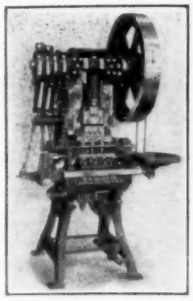
Also makers of Straighteners for Squares, Hexagons, etc., and Riveting Machines.



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BLISS

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BLISS

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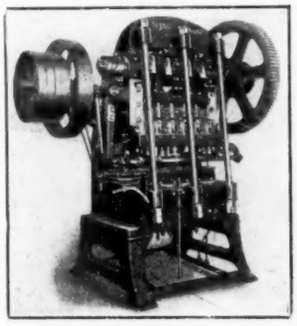
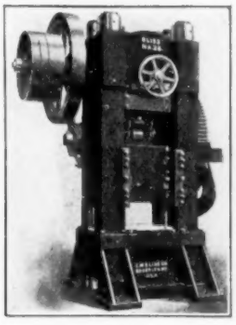


Talk to us about presses for any and every service



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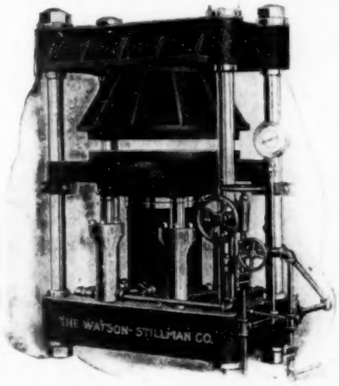

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For Sheet Metal Forming, Drawing, Embossing, Die-Sinking, Metal Extruding, Scrap Baling, etc.

The press shown here is an adaptation of our standard lines of presses, to draw automobile rims from sheet steel. The press consists of one main ram capable of exerting 190 tons pressure upon the platen and four clamping rams. The forming dies are removable. The action of the press is rapid and positive.

We build similar presses for cupping, deep shell drawing, sheet metal forming, etc., the requirements governing the size and capacities of the various rams. We can readily adapt standard design to special requirements.

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A. GARRISON FOUNDRY COMPANY

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One of our largest departments is devoted to Chilled Rolls. We make Chilled Rolls weighing 37½ lbs. for rolling gold and silver and Chilled Rolls weighing 70,900 lbs. for rolling steel plate. The first Chilled Rolls made in America were made by us and we have made a specialty of Rolls and Rolling Mill machinery ever since; for one customer in particular, of more than National prominence, we have made Chilled Rolls continuously since 1843.

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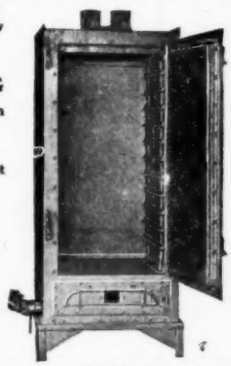
Superior Construction, Economical Operation
For Japanning, Lacquering, Drying and adaptable for many other purposes.

Drying Out Boxes
Fitted with steam coils or gas burners, where steam is not available.



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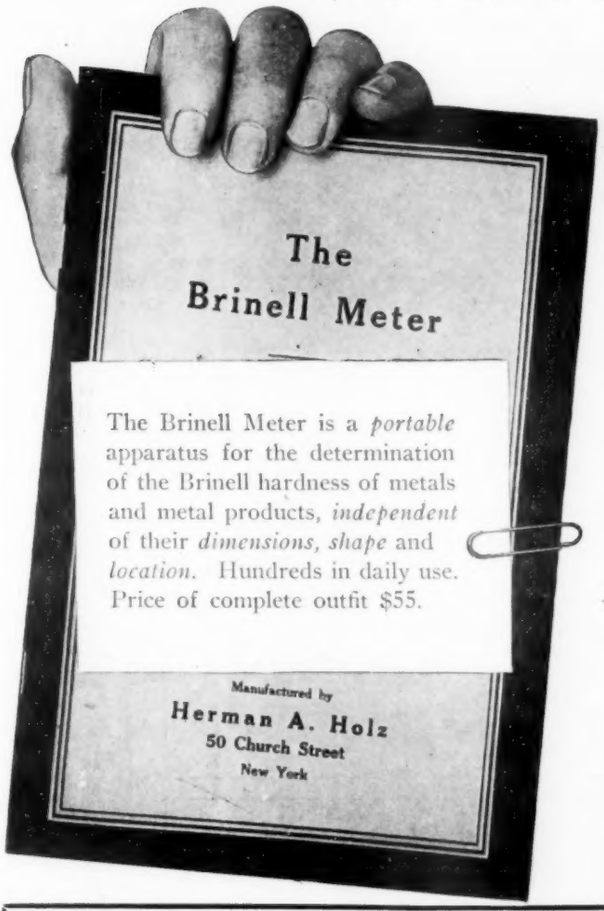
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The Brinell Meter is a *portable* apparatus for the determination of the Brinell hardness of metals and metal products, *independent* of their *dimensions, shape* and *location*. Hundreds in daily use. Price of complete outfit $55.
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Weather-Proof Structural Steel
After It Is in Place

"A Machine Gun Making its Ammunition from Reeled Wire and Coating objects by Bombarding with Minute Plastic Particles of Metal."

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For Softness, Hardness or Strength

Can be operated by non-technical help. The majority of manufacturers are thus ordering their material to specification, as to quality and fitness, meaning that the minority who have not a scleroscope to inspect their material may have to accept the discard of their more up-to-date competitors. It shows if you are getting what you pay for out of your tool steels. SEND FOR OUR 80-PAGE BOOKLET—FREE.

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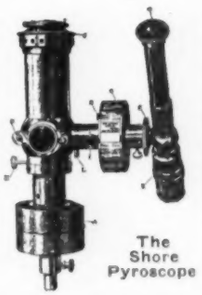
If your heat troubles are still unsolved, investigate the pyroscope, the one common-sense instrument that makes straight for results without fuss. Extreme simplicity—constancy—always ready. Pamphlet on request.



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FOREIGN AGENTS: England, Coates Machine Tool Co., London, Glasgow and Newcastle-on-Tyne. Russia, The M. Mett Eng. Co., Petrograd. Japan, Schuchardt & Schutte, Tokio.

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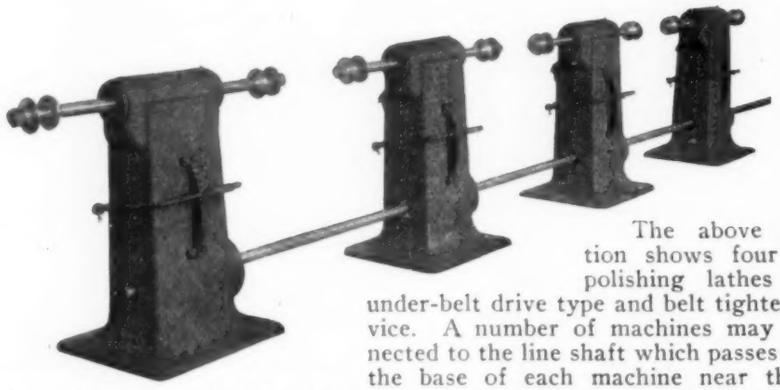
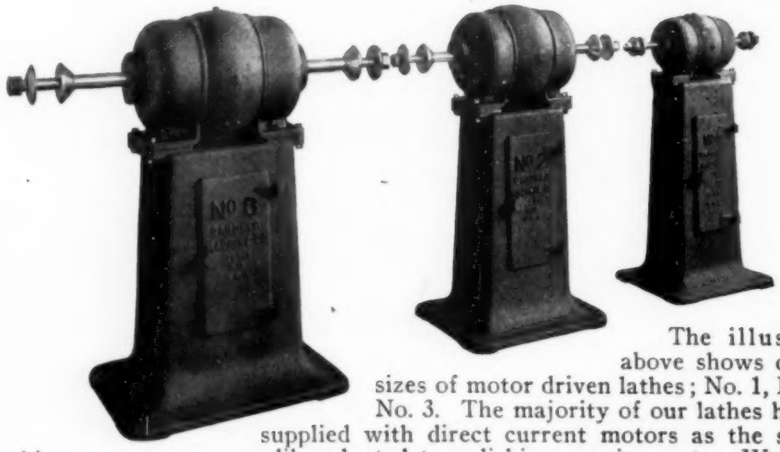
Two Pages from our New Booklet on Ball Bearing Polishing Lathes



The above illustration shows four of our polishing lathes of the under-belt drive type and belt tightening device. A number of machines may be connected to the line shaft which passes through the base of each machine near the floor. This shaft runs in ball-bearings and carries a driving pulley within the base of each machine which is connected to the spindle pulley by means of a slack belt. This arrangement is used when there is not sufficient head room beneath the floor to permit the use of regular counter or jack shafts.



The illustration above shows our three sizes of motor driven lathes; No. 1, No. 2 and No. 3. The majority of our lathes have been supplied with direct current motors as the speeds of this type are more readily adapted to polishing requirements. We can furnish the alternating current type motor, but because of the limited range of speeds obtainable there is but small demand for them and accordingly they are built only on special order.

Free Booklet

This booklet is probably the finest piece of literature ever issued on this class of machinery. It illustrates and describes the many sizes and styles of lathes we build. It gives the different spindle types and general specifications on the whole line. A request on your letter head will bring you a copy by return mail.

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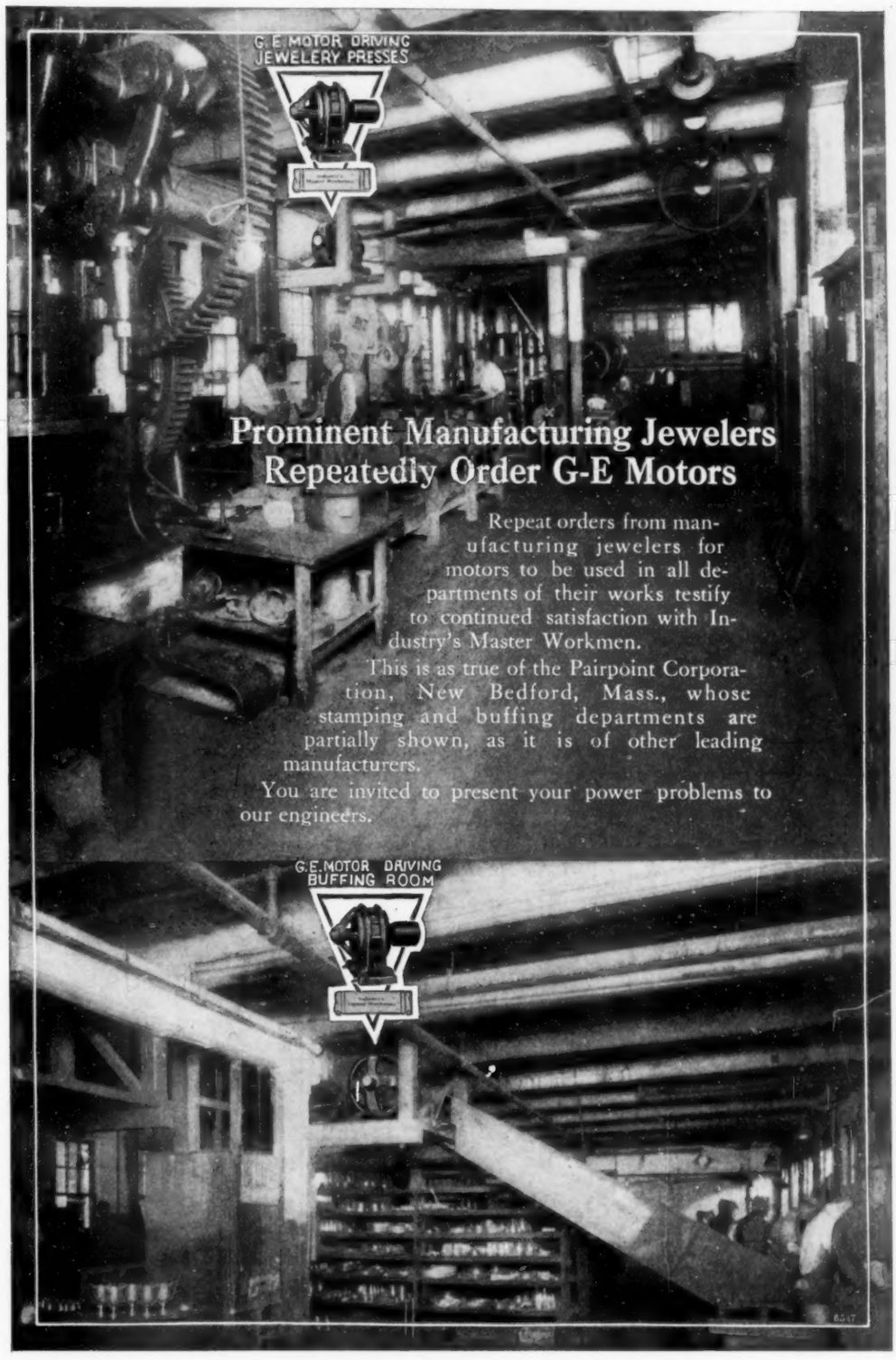
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This is as true of the Pairpoint Corporation, New Bedford, Mass., whose stamping and buffing departments are partially shown, as it is of other leading manufacturers.
You are invited to present your power problems to our engineers.
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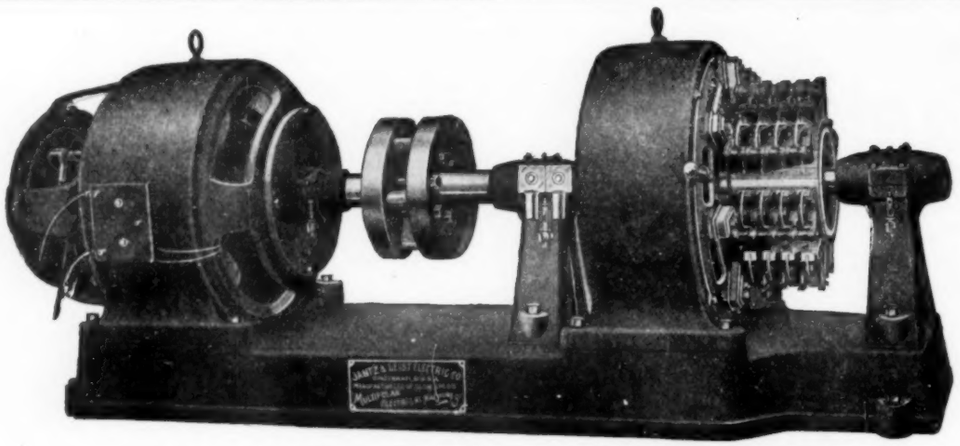

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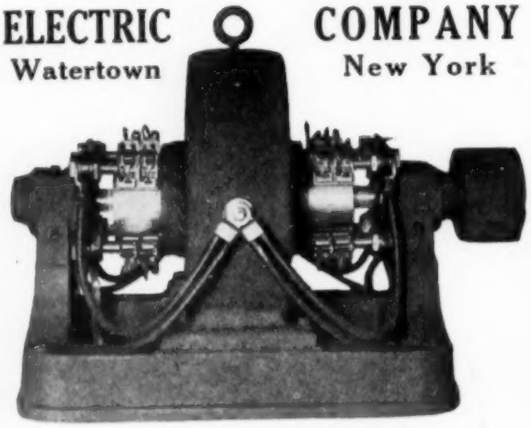

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THE MOST EFFICIENT RHEOSTAT MADE

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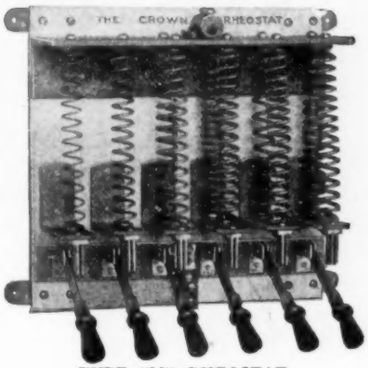
Bulletins and prices on application



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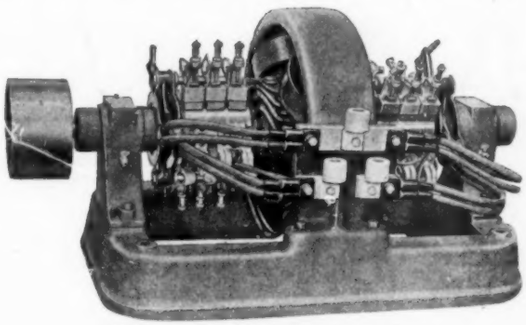

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Look at the name on the best machine in your plant. The one that gives you the least trouble, and then buy another Improved American Giant. It will give you even better service than the one you have.

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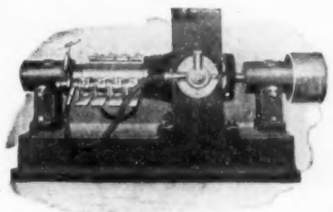

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Shunt, compound and separately excited.

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CHAS. J. BOGUE ELECTRIC CO.

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FLEXIBLE GRINDING

IS DOING

GRINDING WORK

ON FLEXIBLE WHEELS

designed for the purpose, set up with emery and glue, and is a process which eliminates the solid grinding wheel from many classes of work.

The wheels being flexible follow the contour of the work without destroying it, reducing the number of subsequent operations.

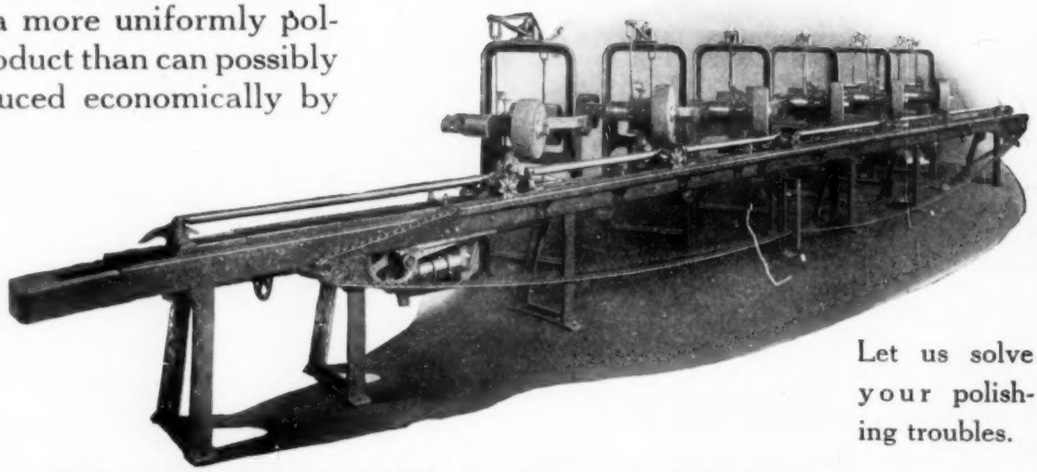
It permits more perfect work, reduces cost is safer and faster than solid grinding wheel operations.

DIVINE BROTHERS COMPANY

UTICA, N. Y. **U. S. A.**

LET ONE MAN DO SIX MEN'S WORK

Each wheel on a Robinson Automatic will save you the wages of one polisher, and will deliver a more uniformly polished product than can possibly be produced economically by hand.

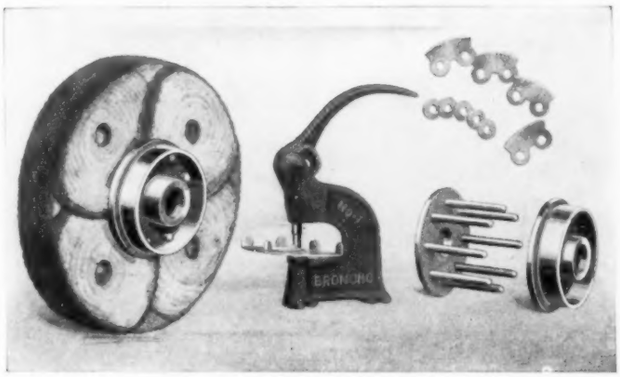


Let us solve your polishing troubles.

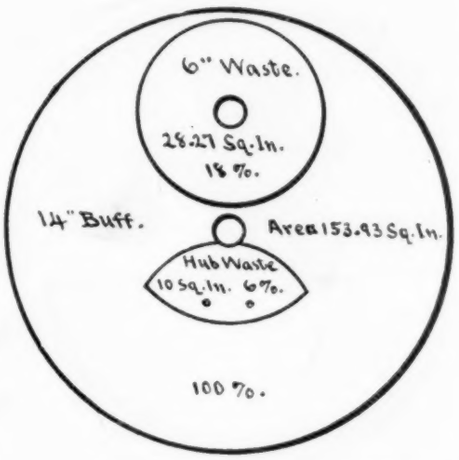
THE ROBINSON AUTOMATIC MACHINE CO.

STATION F. - - DETROIT, MICHIGAN

Use Up Your Old Buff Stubs



With the RELIANCE UTILITY BUFF HUB you can make up your old buff stubs very economically into new wheels 14″ in diameter.



A thoroughly practical method of saving money by utilizing what hitherto has been wasted. Send for Circular "H" and figure out how much you can save.

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You MAY be satisfied in just having "a tank." If, however, you are as particular with equipments as with your stock, then you will demand the tank that must give maximum tank service and a little more.
Such tanks have been made for over 50 years by

A. J. CORCORAN, Inc.
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"Tanks Character" is a book that is yours on request.

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We have just received our tenth consecutive order from the same customer for Lead Lined Tanks, together with Acid-Proof Pipe, Valves and Fittings required for an extension to his plant.

These "repeat" orders are perhaps the best evidence of *satisfaction*.

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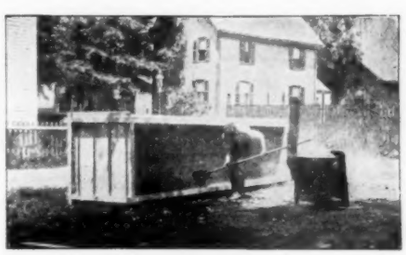
We flow on our lining pitch, making a good heavy coating.

Many only brush it on.



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Operates with much less suction than others and is more quickly adjusted and never in way of operator—

SAVES POWER and TIME

State height of spindle from floor and size of largest wheel used. We'll send one "on trial." If not satisfactory —return at our expense. We design and install Complete Dust Collecting Systems—can rid your polishing and buffing department of **all dust.**

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High Grade Dust Collecting Systems
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Metal and Wire Forming Machines
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We can help you. Send now for our "Dust Collecting" Booklet.

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BOLAND POSITIVE PRESSURE BLOWERS
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Simplest and most positive machine known

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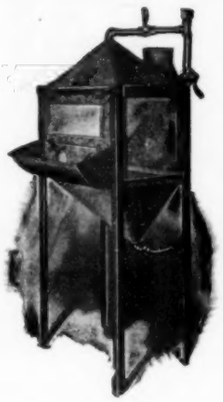
With Removable Individual Inner Tubs
Made in all sizes



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Made in all sizes

We are the largest builders of Jewelers' and Silversmiths' Polishing Machinery in the World.

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Blowers, Hot Blast Dryers, Sinks, Pickle Tanks, Coloring Room Outfits, Dynamos, Sawdust Boxes, and General Factory Equipments. When in Trouble Consult Us

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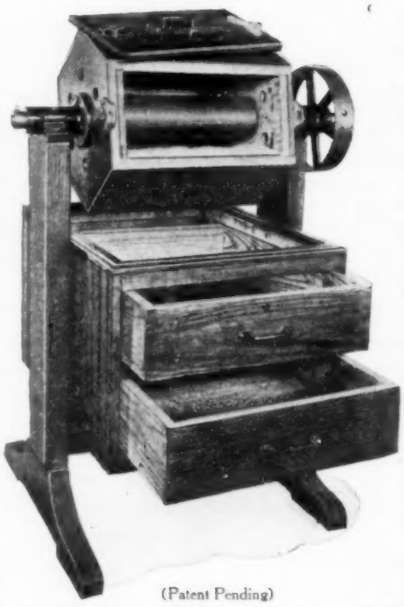
WE CAN HELP YOU ON THIS SERIOUS PROBLEM—DRYING.

NO-DUST DRYING MACHINE CO., 159 DORRANCE ST., PROVIDENCE, R. I.

RICHARDSON DRYING OUT MACHINE



(Patent Pending)

This cut represents our machine for drying out jewelry and small metal parts instantaneously without leaving any spots or tarnish. Can be operated by anyone. The steam drum inside the barrel keeps the sawdust hot. After the pieces are dried the cover is removed from the barrel and the contents drop into the sieve below, the sawdust going through into the draw below, from which it is returned to the barrel ready for another batch. Chain, Buttons, Pins, etc., if allowed to run in this machine will add much to the luster and save buffing.

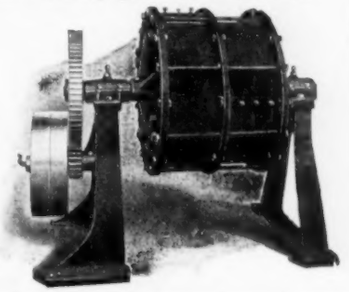
Made in these sizes	No. 20	Hexagon	16¼″ long x 13½″	depth
	No. 21	Octagon	16¼″ long x 18″	depth
	No. 22	12 Sider	16¼″ long x 24″	depth

Manufactured by

SMITH, RICHARDSON CO., Attleboro, Mass., U.S.A.

ONCE AGAIN

WE SAY: Until you have personally investigated the adaptability of the *Abbott Process of Polishing, Burnishing and Buffing* for *your* work, you are not doing justice to yourself or us—you are probably losing money every day—as hundreds of other concerns did until they came to us.



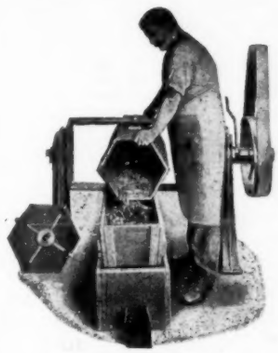
Send samples of your work (prepaid) for us to finish and report on.

Meantime, get our "A B C" Booklet on the *Abbott Process*.

The Abbott Ball Company

Abbott St., Elmwood District Hartford, Conn.

The most extensively used modern method of ball burnishing.



Patent Pending

Manufacturers, Look Here!

Do you need more help? Are you looking for workers? If so, I supply them, thousands of them, yes millions of them, if you need them to do your work. I will guarantee that they will do your work well, that they will prove faithful, that they will not go out on a strike, that they will work as many hours a day as you desire, that they will not grow weary and want to sit down to rest, but will keep right on the job, always busy, FIENDS FOR SERVICE, REGULAR DEVILS FOR WORK.

You cannot scare them by the amount of work you want them to do, for they are of the old-fashioned conscientious disposition—FAITHFUL, CONSIDERATE, CAREFUL and OBLIGING, always working in your interests and never against it, and I can guarantee they will save you money and make large profits for you. They will grind and polish your castings, remove the burrs and polish your stampings, and are always alert and efficient workers.

It will be for your interest to employ enough of these workers to do your work, and I will advise you how many you need and how to employ them to get the best results, providing you send me samples of the work you wish done, with one piece of each kind finished the way you are now finishing them, when I can tell you if your work is suitable to be done by my workers.

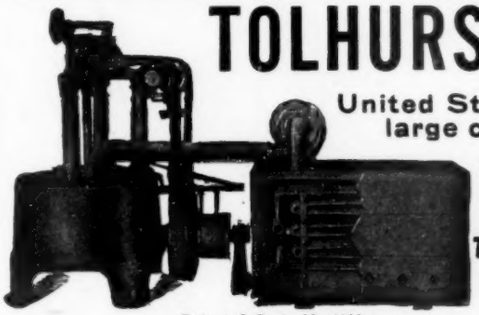
I am also cutting costs in the buffing line, on many articles, from 10 to 40%, and fee sure that I can save you money. Address,

W. R. PARSONS, 411-413 S. CLINTON STREET CHICAGO, ILL.

Drying Metal Goods in Sawdust Is a Thing of the Past

TOLHURST METAL DRYER and BRIGHTENER

United States Mints and many large concerns use them



No sawdust required

Sizes from 12' to 40'

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TOLHURST MACHINE WORKS

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Patented Sept. 19, 1911.

Patented Sept. 19, 1911.

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Actual tests indicate that sulphates not only contaminate the solution, but impair the efficiency of the Cyanide. We would be glad to send samples so that you may demonstrate this to your own satisfaction.

As specialists in the manufacture of chemicals for all kinds of electro deposition, we invite your correspondence and inquiries.

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Why not standardize?

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In One Solution

OUR Service Department will be glad to furnish those interested a complete set of directions for Copper Plating and Cleaning **in one solution** by the use of O. P. C.

This is an important and very practical short cut which should be adopted by every copper plating plant.

OPC

OAKITE PLATERS' CLEANER

There is really nothing to equal the satisfactory performance of O. P. C. in the plating industry.

Not only does O. P. C. do away with the use of caustic potash, but it is decidedly superior to any other form of prepared cleaner.

The reduction of operating costs is but one of the many benefits claimed for O. P. C.

We would be glad to have one of our cleaning experts demonstrate O. P. C. at your plant.

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THIRTY DAY TRIAL OFFER
Write for details of our offer to send a barrel of O. P. C. on 30 days' trial subject to the terms of our Positive Guarantee

1916-1917

The good things in life never grow old, and in extending to you, friends and users of

Wyandotte Metal Cleaner

the Season's Greetings we do so not because of custom, but because of our sincere appreciation of the generous patronage so abundantly bestowed.

To have done something your fellow man deems worth while creates an appreciation not easily expressed in words, but if what we cannot convey in print can be made known in an earnest endeavor to further perfection in manufacture and service, electroplaters and metal manufacturers will the coming year have an expression of our gratitude.

And as the Yuletide approaches we wish you a Merry, Merry Christmas and a New Year full of Joy and Prosperity.

The J. B. Ford Co.

Sole Manufacturers

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GET OUR PROPOSITION ON CHEMICALS FOR 1917

Mark down the quantities you will require and send for our contract prices. We carry carload stocks of various materials and can quote attractive prices.

One of Our Specialties is the

Deloye Anode

(PATENTED)

The Most Efficient Anode Ever Devised

Every plater whom we have approached has admitted that the Deloye Patented Anode is the ideal type of anode. It has been proved by actual test to be the superior of all others in regard to time and evenness of deposit and minimum amount of resulting scrap.

We will have ready in a few weeks our new foundry which will be the most complete of its kind for casting nickel anodes so that we can turn out goods with the quickest possible despatch.

We are also paying particular attention to the structure of the anode as regards its future behavior in the plating bath.

Another specialty—Copper and Nickel Hooks with bakelite insulation so that the anodes may be completely immersed under the solution.

We have every chemical required for electroplating and earnestly solicit your patronage.

MATERIALS	REQUIREMENTS
Alcohol, Denatured	
Anodes, Nickel (any percentage)	
Borax, 20 M. T. (carloads)	
Boric Acid	
Cleaner, Wyandotte Metal	
Cream Tartar Substitute	
Cyanide, Copper	
Cyanide, Zinc	
Nickel Salts, Double	
Nickel Salts, Single	
Sal Ammoniac, White Granular	
Sal Ammoniac, Rough Grey	
Saltpetre, Substitute "Potnitre"	
Soda Caustic, Broken 98%	
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Turpentine, Pure Gum Spirits	

Please write us giving your requirements and we will quote you our best prices.

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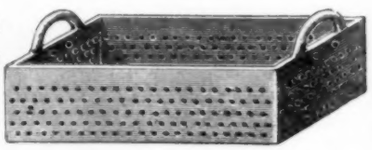

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All Kinds of Special Wire Work

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Founded 1880 Southport, Conn. Incorporated 1901

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Superior Nickel Anodes, Purity and Quality Guaranteed. Polishing and Plating Supplies.

Dynamos COMPLETE PLANTS Rheostats

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DIPPING BASKETS

Any Shape, Size or Mesh

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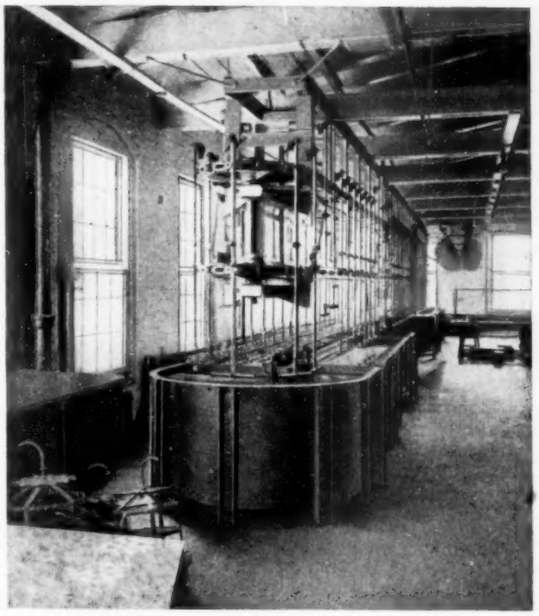
Mfrs. of Wire Cloth, Wire Machinery Guards, Wire Work for Every Purpose

1917 IS ALMOST HERE

And you will soon figure on next year's requirements. We have up-to-date equipment and are in a position to quote attractive prices and make prompt delivery on Buffing and Electro-Plating Supplies.



Ten Manufacturers Will Cut Their Plating Costs 66⅔% in 1917. Will You Be One?

In conformity with our policy of maintaining our reputation as the most progressive house in our line, we have secured exclusive patent rights on the **Broderick Continuous Process Plating Machine,** which is now offered for the first time to the trade in general.

Our production facilities limit our output for the year 1917 to ten machines, and we shall be obliged to decline orders in excess of this number until a later date.

The Broderick Machine consists of a series of tanks containing the cleaning baths, dips, rinses and plating solutions, through which the work is passed by means of a series of carriers suspended from and actuated by an overhead chain conveyor. By means of an ingeniously simple mechanism each carrier as it approaches the end of a tank is raised, lifting the work over the partition between adjacent tanks and lowering it into the next tank. *In short, the Broderick machine does mechanically what the plater does manually.* It immerses the work in the cleaning bath, transfers it to a rinse, to the cyanide, to a rinse, to the plating tank, to a final rinse, and delivers it to the operator at the starting point, completely plated and ready for drying.

ITS CAPACITY is almost unlimited. Upwards of 100,000 pieces of work per day are turned out on a single machine in several plants where they are installed.

RAPIDITY OF PLATING is from two to four times that of still tanks because the agitation caused by the movement of the work through the bath permits of very high current densities.

UNIFORMITY OF PLATING: Current conditions and conveyor speed being fixed and solutions kept constant, every piece of work receives exactly the correct length of cleaning bath, dips and plating baths, and the result must necessarily be identical. The personal equation is eliminated.

COST OF OPERATION is that of a ½ H. P. motor besides the current taken by the cleaning and plating tanks.

COST OF MAINTENANCE is that of any small powered slow moving piece of apparatus—negligible. Keep it oiled and the nuts tight—that is all.

LABOR COST is far less than with still tanks. One boy or girl to hang the work on the carriers and take it off after it has completed the circuit of the tanks is usually sufficient, while the plater performs his real function, as an expert, of maintaining solutions, setting speeds, etc.

Eighteen machines in successful operation are proving the foregoing claims daily. Tell us your requirements and we will gladly send you full data and specifications.

This is a big proposition for big plating requirements and will show big dividends on its cost to those who are doing work in a big way.

Are you one? If so, let us get together.

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Reliability, Service and Quality

MUNNING-LOEB COMPANY

MATAWAN, NEW JERSEY

MANUFACTURERS OF

Anodes, Brushes, Buffs, "None-Such" Carboy Rockers, Dynamos, Lathes, "None-Such" Rotating Plating Machines, Chemicals, Compositions, Salts, Rouges, Tanks, Wheels

A comprehensive stock of all products is carried for immediate delivery at our Chicago Office and Stock Room, 9 South Clinton Street

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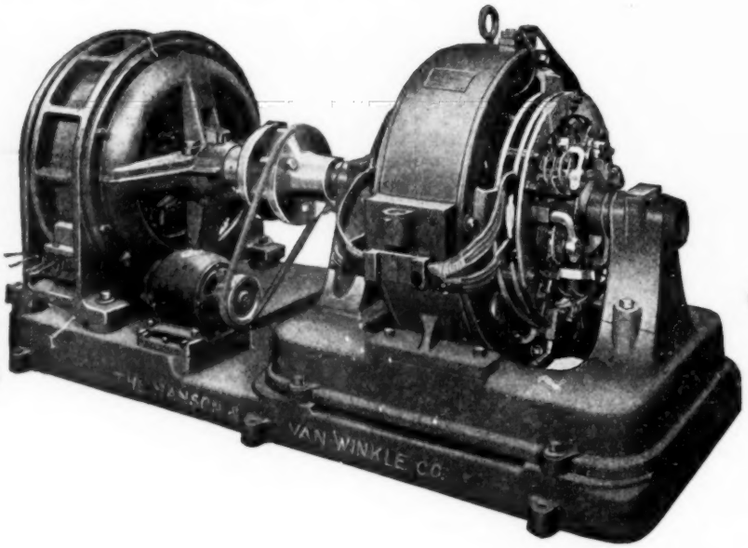
We Furnish Everything Required and Manufacture

Dynamos for Electroplating

From 50 to 10,000 Amperes



Also Motor Generator Sets

LOOK OVER YOUR PLATING ROOM CAREFULLY

and consider, if it may not be possible to turn out a greater quantity of better finished work in a shorter time and at less expense. Then write us, and arrange for an appointment to come and see us, or to send your plater, to look over our various labor and time saving devices. We are sure it will pay you and our experts will give you a demonstration and any necessary advice, without cost.

We have in operation a very complete and up-to-the-minute mechanical demonstrating department.

WE ARE THE ORIGINATORS OF **COLD GALVANIZING.** AMERICAN PROCESS. SAMPLES AND INFORMATION ON APPLICATION AND HEADQUARTERS FOR

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ESTABLISHED 1820

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SAN FRANCISCO Agency, 268 Market Street

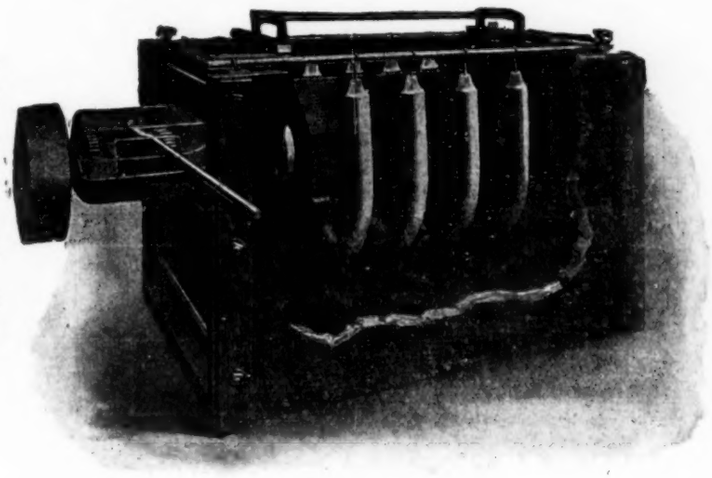
CANADA OFFICE: Canadian Hanson & Van Winkle Co., Limited, Morrow Ave., Toronto, Ont.

Mechanical Electro-Plating Apparatus

United States Patents June 22, 1897—Feb. 24, 1903—Oct. 11, 1904—March 24, 1908—May 19, 1908.
Canadian Patents Nos. 58,205 and 97,852. Other Patents Pending.

These machines are for electro-plating quantities of small work in bulk, saving time, labor, and expense.

If you have a mechanical Plating Proposition of any kind, put it up to us. We lead in this branch as in all others.



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(pentasulphide)

As Efficient as Sulphuret of Potash, but low in price. Satisfaction guaranteed or no charge made.

Made by a special process by

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Manufacturers of Industrial Chemicals
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CHEMICALS

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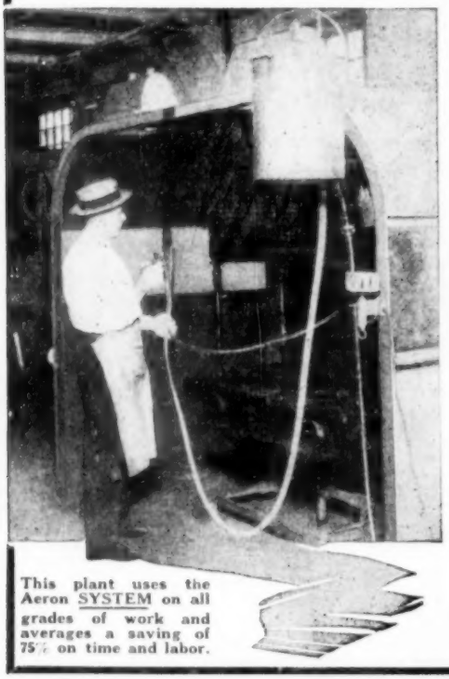

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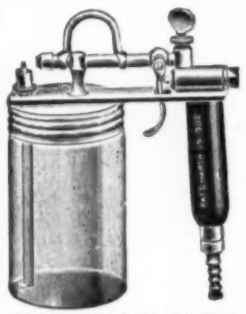

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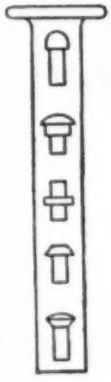

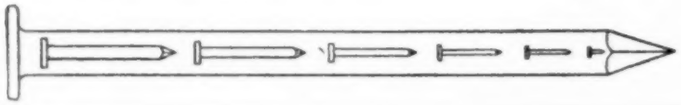

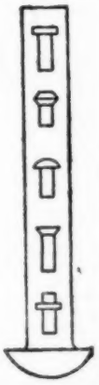

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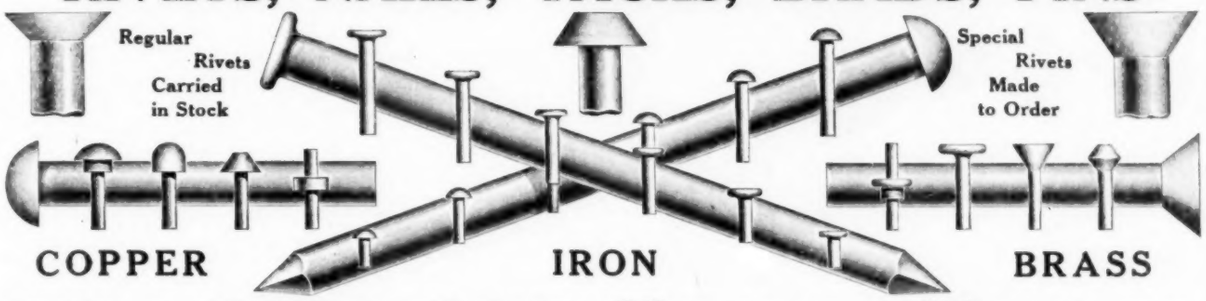

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WANTED—Second-hand Brass Furnaces, Tumbling Barrels, Sprue Cutters, Core Ovens, Brass Foundry Equipment. Send full particulars to

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PITTSBURGH, PA.

SCHWARTZ FURNACE

WANTED—One 60" Hawley—Schwartz or equivalent Down Draft oil-burning surface, in good condition.

Z. Y. X., Care THE METAL INDUSTRY.

ALLIGATOR SHEAR

WANTED—Large alligator shear, 3" capacity, length of shear 16" or longer. Give full particulars and price for immediate shipment. THE WINCHESTER B & C COMPANY, Station A, Winsted, Conn.

SPACE FOR SALE

SEND FOR RATES

AN EXCHANGE FOR THE NEEDS OF THE METAL AND PLATING TRADES

TRADE WANTS

ANSWERS SENT IN CARE OF THE METAL INDUSTRY WILL BE FORWARDED

SITUATIONS OPEN

Display Advertisements, $3.00 Per Inch, One Column Wide, Each Insertion

SPECIAL NOTICE

After January 1st, 1917—A Pennsylvania Company, established 1892, will require the services of high grade men having an established following in the brass casting trade.

An unusual opportunity for real producers.

To qualify it will be necessary to submit references, territory covered, and a record of sales over a period of one year, showing a minimum of 20,000 pounds per month. If you are able to qualify satisfactory arrangements will be made. Write, giving full information to:

Room 302
Mutual Life Building
Philadelphia : : : : : Penna.

COPPER AND BRASS MILL ACCOUNTANT

WANTED — An Accountant having thorough knowledge of COPPER AND BRASS MILL ACCOUNTING. Give full details of experience and references, also salary expected. Address,
MILL ACCOUNTANT, care THE METAL INDUSTRY

Spelter Engineer

WANTED—An English spelter company, limited, with works in England, wishes to communicate with an engineer having a thorough up-to-date practical knowledge of the spelter trade, and the most modern plant and buildings as now adopted in the States. All privacy observed. Liberal terms would be arranged in keeping with results. Address

BOX W 316,
Care of Dawson's, 121 Cannon Street,
London, E. C., England.

METALLURGIST and CHEMIST

WANTED—A practical Chemist and Metallurgist. Must thoroughly understand analysis of all non-ferrous alloys and metals. One familiar with Brass and Copper Rolling Mill metals preferred. Excellent opportunity. State age, past experience and salary expected. References required. Address

CHEMIST-METALLURGIST,
Care THE METAL INDUSTRY.

TUBE MILL SUPERINTENDENT

WANTED—An Experienced TUBE MILL SUPERINTENDENT. Good handler of men and able to produce results. Give age, experience and salary wanted. Address TUBE SUPERINTENDENT,
Care THE METAL INDUSTRY.

ASSISTANT FOUNDRY FOREMAN

WANTED—A large automobile concern in the Middle West desires an assistant foreman for its aluminum foundry. The applicant must be experienced, have a thorough knowledge of molding and familiar with casting aluminum. State age, salary expected and give a complete history of your experience. Furnish references. Address

ALUMINUM FOREMAN,
Care THE METAL INDUSTRY.

DIE and TOOL MAKER

WANTED—Experienced Die and Tool Maker for Brass Rod Rolling Mill. A man competent to take charge of die and tool making department. References required. Reply

DIE AND TOOLS,
Care THE METAL INDUSTRY.

AN EXCHANGE FOR THE NEEDS OF THE METAL AND PLATING TRADES

TRADE WANTS

ANSWERS SENT IN CARE OF THE METAL INDUSTRY WILL BE FORWARDED

SITUATIONS OPEN—Continued

FOREMAN PLATER

WANTED—Foreman Plater for silverware factory—must be high class man capable of taking full charge and producing quality finishes efficiently. Applicants not considered unless positively having had broad experience on nickel silver, Britannia and novelties.

Give full information, past experience and references in first letter. Address,

SILVER PLATER,
Care THE METAL INDUSTRY.

PLATING SALESMAN

WANTED—Salesman having had practical knowledge of electroplating; man preferred having had actual shop experience and having a thorough and wide knowledge of this subject. Address

PLATING SALESMAN,
Care THE METAL INDUSTRY.

GRINDER AND BUFFER

WANTED—A first class grinder and buffer for job plating shop. Good opening for right man, steady work, 8 hours. In reply state wages expected and experience and date you could accept position.

JOHN A. GOTTSMAN & CO.,
150 Pierce St., N. W., Washington, D. C.

NAME PLATE EXPERT

WANTED—Young man who understands the etched name plate business thoroughly, capable of establishing plant. Must know latest process, etc. Write

COLONIAL BRASS COMPANY,
Middleboro, Mass.

SILVER AND GOLD PLATER

WANTED—First-class PLATER to accept position in Grand Rapids, Mich. Young man preferred. State age, experience, wages expected, etc. Address

SILVER-GOLD,
Care THE METAL INDUSTRY.

PLATER

WANTED—Electro Plater for silverware to act as foreman. Must be a thorough practical plater, buffer, solderer and designer. Excellent prospects. Young man preferred and must have good appearance. Position open to Canadians or Americans. Location large Canadian city. Address

ELECTRO-PLATER,
Care THE METAL INDUSTRY.

SITUATIONS WANTED

Undisplayed Advertisements Under This Heading 50 Cents Each Insertion. Displayed Advertisements $1.50 per inch one column wide each insertion. Ads under this heading are payable in advance.

EXECUTIVE

SITUATION WANTED—By a Brass Mill Works Manager experienced in all branches from casting to finished product sheet, rod or tube. Thirty-nine years old; thirteen years with present employers; at present in above capacity. Would like opportunity to build new plant or operate old on a commission basis. Address BRASS MILL MANAGER, care THE METAL INDUSTRY.

SITUATION WANTED—Energetic man open for executive position, many years' valuable experience with leading Brass and Copper Rolling Mills and Jobbing Houses. Departments covered—Sales, Credits, Production, Purchasing, Accounting, Systematic Modern Methods. Capable of holding position as General Manager. Address EXECUTIVE, care THE METAL INDUSTRY.

SITUATION WANTED—SUPERINTENDENT OR GENERAL MANAGER of rolling mill for all kinds of metal alloys. Wide experience in economical metal production. Good executive. Has designed and is operating a modern rolling mill giving maximum production at minimum cost. Address MANAGER, care THE METAL INDUSTRY.

SITUATION WANTED—A practical and efficient brass foundry superintendent of broad experience in modern brass foundry practice would like to negotiate with an up-to-date firm who is in need of the service of a man that can handle men to the best advantage and produce first class results at a minimum cost. Highest reference furnished and could accept a position as superintendent or foreman of a modern plant on short notice. Address EFFICIENT, care THE METAL INDUSTRY.

METALLURGIST AND CHEMIST

SITUATION WANTED—A Practical Metallurgist and Chemical Engineer is open for a position with a progressive concern that would offer a chance of advancement. Advertiser thoroughly understands the manufacture, analysis and reclaiming of all non-ferrous alloys and metals and the electro-plating of metals on a commercial basis. Thirty years old, with nine years' experience. Modest salary to start. Address NON-FERROUS, care THE METAL INDUSTRY.

MANUFACTURERS' AGENT

SITUATION WANTED—Manufacturers' Agent now handling metal finishing equipment and supplies in Connecticut wishes to add other non-competing lines for his field. Especially wants good line of buffs and polishing compounds. Maintains office in Hartford and has thorough acquaintance with firms in Hartford and New Haven Counties. Address, MANUFACTURERS' AGENT, care THE METAL INDUSTRY.

BRASS PLANT FOREMAN

SITUATION WANTED—As General Foreman or gang foreman of Brass Plant manufacturing plumbers' supplies, valves, steam goods and general line of brass goods. Had 25 years first class practical experience as foreman and workman on Compression Fuller, Ground Key, Quick pression, Dbl. Bath and Basin cocks, Self-closing and Telegraph work. Capable of handling a large force of help, can produce good results at low cost, latest experience and up-to-date tools and machinery, 43 years of age, married, sober and steady hard worker. With my present employer for six years; best of references as to ability and character. City or country. Address GENERAL FOREMAN, care THE METAL INDUSTRY.

MACHINE SHOP FOREMAN

SITUATION WANTED—As Foreman or Superintendent of brass machine shop, 20 years experience in plumbers and steamfitters supplies, automobile and specialty work. Thoroughly familiar with modern machinery and methods. Would like to connect with reliable firm who could offer advancement. Address BRASS MACHINE SHOP, care THE METAL INDUSTRY.

FOUNDRY FOREMAN

SITUATION WANTED—As Foundry Foreman. Expert on all metals and latest methods in foundry practice. Also understands the melting of Monel Metal. Address, Expert Foreman, care THE METAL INDUSTRY.

ETCHER

SITUATION WANTED—By an etcher with over twenty years experience in decorative etching on all forms and shapes of metal articles.

Thoroughly understand the best processes used in the art. Advice and instruction supplied on any matter pertaining to etching. Best of references given. Address

PRACTICAL ETCHER,
Care THE METAL INDUSTRY.

PLATERS AND POLISHERS

ELECTRO-PLATERS

Anyone desiring the services of first-class men for the electro-deposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the American Electro-Platers Society.

WALTER FRAINE,
507 Grand Avenue, Dayton, Ohio.

SITUATION WANTED.—As General Foreman of Polishing and Buffing Department. Up-to-date on the latest methods. At present employed by a large concern, but for the best of reasons wishes to make a change. Can furnish best of references. Can handle help and produce the goods. Address, Polishing Foreman, care THE METAL INDUSTRY.

SITUATION WANTED—By a Foreman Plater. Can make all kinds of solutions and produce all finishes on hard and soft metals. Not afraid of work. Strictly temperate. Wages reasonable. Address F-1, care THE METAL INDUSTRY.

SITUATION WANTED—By a Foreman Plater, not a self-styled expert, but a practical all-round man, 20 years' experience doing gold, silver, bright silver, nickel, black nickel, brass, bronze and copper plating, coloring, oxidizing and bronzing upon both soft and hard metals. Thoroughly experienced upon silverware, art metal novelties, ecclesiastical goods, casket hardware, builders' hardware, ornamental brass and iron, plumbing and bath room supplies and antimonial lead novelties. Familiar with salt water gilding, ormolu gold, French gray and mechanical plating. Am at present foreman of a large plating department. Can furnish high-grade references. For further information address HYDROPLASTIC, care THE METAL INDUSTRY.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Abrasives.
Bennett-O'Connell Co., Chicago, Ill.
Burns, E. Reed, Supply Co., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Handy & Harman, New York.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
Niagara Emery Mills, New York.
Rhodes, Jas. H., Co., New York.

Accumulators, Hydraulic.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Acids (See Platers' Supplies).

Acid-Proof Stoneware.
Burns, E. Reed, Supply Co., Brooklyn, N. Y.
German-American Stoneware Works, New York.

Air Brushes, Filters and Accessories.
De Vilbiss Mfg. Co., Toledo, O.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Eureka Pneumatic Spray Co., New York.

Air Compressors.
De Vilbiss Mfg. Co., Toledo, O.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Eureka Pneumatic Spray Co., New York.
General Electric Co., Schenectady, N. Y.
Leiman Bros., New York.
New Haven Sand Blast Co., New Haven, Conn.

Alloys (Carbon Free).
Goldschmidt Thermit Co., New York.

Alloys Made to Specifications.
Ajax Metal Co., Philadelphia, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Columbia Smelting & Refining Works, New York.
Contes, Bennett & Reidenbach, Inc., Rochester, N.Y.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Goldschmidt Thermit Co., New York.
Lang, R. F., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Ney, The J. M., Company, Hartford, Conn.
North American Smelting Co., Philadelphia, Pa.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., Inc., New York.

Aluminum Alloys.
Ajax Metal Co., Philadelphia, Pa.
Aluminum Co. of America.
Birkenstein, S., & Sons, Chicago, Ill.
British Aluminum Co., Ltd., New York and Toronto.
Electric Smelting & Alum'n Co., Lockport, N. Y.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Seligman, Arthur, New York.
United Smelt. & Aluminum Co., New Haven, Conn.
U. S. Reduction Co., Chicago, Ill.

Aluminum Bronze Ingots.
Electric Smelting & Alum'n Co., Lockport, N. Y.

Aluminum Castings.
Aluminum Company of America, Pittsburg, Pa.
Light Mfg. & Foundry Co., Pottstown, Pa.
North American Smelting Co., Philadelphia, Pa.

Aluminum Die Castings.
Doehler Die-Casting Co., Brooklyn, N. Y.
Maiwurm Aluminum Corporation, Pittsburgh, Pa.

Aluminum Electrical Conductors.
Aluminum Company of America, Pittsburg, Pa.
British Aluminum Co., Ltd., New York and Toronto.

Aluminum Flux.
Allen, L. B., Co., Inc., Chicago.
Paxson, J. W., Co., Philadelphia, Pa.

Aluminum Granulated.
Seligman, Arthur, New York.
United Smelt. & Aluminum Co., New Haven, Conn.
U. S. Reduction Co., Chicago, Ill.

Aluminum Ingots.
Ajax Metal Co., Philadelphia, Pa.
Aluminum Company of America, Pittsburg, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
British Aluminum Co,, Ltd., New York and Toronto.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Kemp, W. H., Co., New York.
Leavitt, C. W., & Co., New York.
Leygrand & Co., Inc., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Seligman, Arthur, New York.
Trotter, Nathan, & Co., Philadelphia, Pa.
United Smelt. & Aluminum Co., New Haven, Conn.
U. S. Reduction Co., Chicago, Ill.
Wenger, Paul, New York.

Aluminum Match Plates.
British Aluminum Co., Ltd., New York and Toronto.
Seligman, Arthur, New York.
Turner Machine Co., Philadelphia, Pa.

Aluminum Moldings and Extruded Shapes.
Aluminum Company of America, Pittsburg, Pa.
British Aluminum Co., Ltd., New York and Toronto.
Seligman, Arthur, New York.

Aluminum Powder, Leaf and Foil.
Aluminum Company of America, Pittsburg, Pa.
British Aluminum Co., Ltd., New York and Toronto.
Kemp, W. H., Co., New York.
Leygrand & Co., Inc., New York.
Seligman, Arthur, New York.

Aluminum Rivets.
British Aluminum Co., Ltd., New York and Toronto.
Hassall, John, Inc., Brooklyn, N. Y.
Kemp, W. H., Co., New York.
Seligman, Arthur, New York.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Aluminum Sheets, Rods and Wire.
Aluminum Company of America, Pittsburg, Pa.
British Aluminum Co., Ltd., New York and Toronto.
Electric Smelting & Alum'n Co,, Lockport, N. Y.
Kemp, W. H., Co., New York.
Leygrand & Co., Inc., New York.
Richards & Co., Boston, Mass.
Seligman, Arthur, New York.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
United Smelt. & Aluminum Co., New Haven, Conn.

Aluminum Solder (See Solder).

Aluminum Tubes.
Aluminum Company of America, Pittsburg, Pa.
British Aluminum Co., Ltd., New York and Toronto.
Kemp, W. H., Co., New York.
Seligman, Arthur, New York.

Ammeters and Voltmeters (See Platers' Supplies).

Amyl Acetate (See Platers' Supplies).
Franco-American Chemical Co., Carlstadt, N. J.

Annealing Muffles.
Metals Production Equipment Co., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell, W. S., Co., New York.
Whiting Foundry Supply Co., Harvey, Ill.

Annealing Pans.
Sly, W. W., Mfg. Co., Cleveland, Ohio.

Anodes, Brass, Copper or Nickel (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Ely, C. Upham, New York.
Hanson & Van Winkle Co., Newark, N. J.
Hussey, C. G., & Co., Pittsburg, Pa.
L'Hommedieu, Chas. F., & Sons, Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.
Sheldon, Wm. O., & E. R., New York.
Stamford Rolling Mills, Inc., New York.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Anodes, Gold.
Handy & Harman, New York.
Jackson, John J., Newark, N. J.
Ney, The J. M., Company, Hartford, Conn.

Anodes, Platinum.
Handy & Harman, New York.
Ney, The J. M., Company, Hartford, Conn.
Roessler & Hasslacher Chemical Co., New York.
Stein, Wm. A., Newark, N. J.

Anodes, Silver (See also Platers' Supplies).
Handy & Harman, New York.
Jackson, John J., Newark, N. J.
Ney, The J. M., Company, Hartford, Conn.

Anodes, Zinc (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Burns, E. Reed, Supply Co., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Wiarda & Co., John C., Brooklyn, N. Y.

Antimonial Lead.
Leavitt, C. W., & Co., New York.
North American Smelting Co., Philadelphia, Pa.
Seligman, Arthur, New York.
Standard Rolling Mills Inc., New York.
United Smelting & Refining Co., Inc., New York.

Antimony Metal.
Ajax Metal Co., Philadelphia, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Cooper, Charles, & Co., New York.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Seligman, Arthur, New York.
Trotter, Nathan & Co., Philadelphia, Pa.
Union Smelting & Refining Co., Inc., New York.
U. S. Reduction Co., Chicago, Ill.
Wah Chang Mining & Smelting Co., Ltd., N. Y.
Wenger, Paul, New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Ashes Grinders and Separators.
Paxson, J. W., Co., Philadelphia, Pa.

Assayers and Chemists.
Dover Laboratory, Dover, N. J.
Handy & Harman, New York.
Ledoux & Co., New York.
Thompson & Morrison, Toronto, Ont.

Automatic Buffing and Polishing Machines.
Automatic Buffing Machine Co., Buffalo, N. Y.
Robinson Automatic Machine Co., Detroit, Mich.

Automatic Wire and Metal Working Machinery.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Shuster, F. B., Co., New Haven, Conn.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Babbitt Metals.
Ajax Metal Co., Philadelphia, Pa.
American Boron Products Co., Reading, Pa.
Benson, H. K. & F. S., Glen Ridge, N. J.
Birkenstein, S., & Sons, Chicago, Ill.
Columbia Smelting & Refining Works, New York.
Damascus Bronze Co., Pittsburg, Pa.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Michigan Smelting & Refining Co., Detroit, Mich.
New Era Mfg. Co., Kalamazoo, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Union Smelting & Refining Co., New York.

Babbitt Molds.
Paxson, J. W., Co., Philadelphia, Pa.
Schweizer, Chas. K., Co., St. Louis, Mo.

Bakelite.
General Bakelite Co., New York.

Baking Ovens.
Gehnrich, Herman, New York.
General Electric Co., Schenectady, N. Y.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Balls, Steel, for Burnishing.
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Smith, Richardson Co., Attleboro, Mass.

Belts, Polishing.
Ames Sword Co., Chicopee, Mass.

Block Tin (See Tin).

Block Tin Pipe.
North American Smelting Co., Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., Inc., New York.

Blowers and Blow Piping.
Allington & Curtis Mfg. Co., Chicago, Ill.
Astle, H. J., & Co., Providence, R. I.
Cleveland Blow Pipe & Mgf. Co., Cleveland, O.
Drachsler, A. A., New York.
Kirk & Blum Co., Cincinnati, O.
Leiman Bros., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
New Haven Sand Blast Co., New Haven, Conn.
Ohio Blower Co., Cleveland, O.

Blow Torches, Gas.
Allen, L. B., Co., Inc., Chicago.

Boiler Graphite.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Obermayer, The S., Co., Chicago, Ill.

Boron and Boron Copper Products.
American Boron Products Co., Reading, Pa.
General Electric Co., Schenectady, N. Y.

Boron Flux.
American Boron Products Co., Reading, Pa.
General Electric Co., Schenectady, N. Y.

Branding Tools, Gas.
Allen, L. B., Co., Inc., Chicago, Ill.

Brass and Bronze Architectural Work.
Jelliff, C. O., Mfg. Corp., Southport, Conn.
Manhattan Brass Co., New York.

Brass Discs, Cups, Etc.
Metals Trading Corporation, New York.
Stamford Rolling Mills, Inc., New York.
Standard Rolling Mills Inc., New York.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Brass, Bronze and Composition Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
American Brass Co., Waterbury, Conn.
Birkenstein, S., & Sons, Chicago, Ill.
Contes, Bennett & Reidenbach, Inc., Rochester, N. Y.
Damascus Bronze Co., Pittsburg, Pa.
Illinois Smelting & Refining Co., Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Seligman, Arthur, New York.
Taunton New Bedford Copper Co., New Bedford, Mass.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Brass, Bronze, Copper and Oreide Sheet, Wire, Rod, Tubes, Etc.
American Brass Co., The, Waterbury, Conn.
Benson, H. K. & F. S., Glen Ridge, N. J.
Bridgeport Brass Co., Bridgeport, Conn.
Continuous Casting Corporation, Newark, N. J.
Dallas, A. C., & Son, Inc., Chicago, Ill.
Damascus Bronze Co., Pittsburg, Pa.
Dueber Watch Case Mfg. Co., Canton, O.
Gem Mfg. Co., N. S., Pittsburgh, Pa.
Hendricks Bros., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Lang, R. F., New York.
Leavitt, C. W., & Co., New York.
Manhattan Brass Co., New York.
Metal Export Co., New York.
Metals Trading Corporation, New York.
National Brass & Copper Co., Lisbon, O.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

National, The, Co., Waterbury, Conn.
Pilling Brass Co., Waterbury, Conn.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Sheldon, Wm. O. & E. R., New York.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Toothill Rolling Mills, Inc., Brooklyn, N. Y.
Taunton-New B'f'd Copper Co., New Bedford, Mass.
Trumpbour-Whitehead Co., New York.
Wells, A. H., Co., Waterbury, Conn.

Brass and Bronze Founders.
Ajax Metal Co., Philadelphia, Pa.
North American Smelting Co., Philadelphia, Pa.

Brass Forgings.
Metals Trading Corporation, New York.

Brass Foundry Equipment (See Foundry Supplies and Equipment).

Brass Mill Machinery.
Torrington Mfg. Co., Torrington, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Waterbury (Conn.) Farrel Fdy. & Machine Co.

Brazing Paste.
Allen, L. B., Co., Inc., Chicago, Ill.

Brinell Hardness Testing Instruments.
Holz, Herman A., New York.

Briquetting Machines.
General Briquetting Co., New York.

Britannia Metal.
Benson, H. K. & F. S., Glen Ridge, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Toothill Rolling Mills, Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., Inc., New York.

Bronze Sheets, Wire Rods, Etc. (See Brass, Bronze and Copper Sheets, Etc.)

Bronze Tubes (See Brass, Bronze and Copper Tubes).

Brushes, Wire and Bristle (See also Foundry Supplies and Platers' Supplies).
Blumenthal, H., & Co., New York.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Gem Mfg. Co., N. S., Pittsburgh, Pa.
Hanson & Van Winkle Co., Newark, N. J.
Herold Bros. Co., Cleveland, O.
Munning-Loeb Co., Matawan, N. J.
Obermayer, The S., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.

Buffing and Polishing Supplies and Equipment (See Platers, Polishers' and Galvanizers' Supplies).

Bull-Dozers.
Wood, R. D., & Co., Philadelphia, Pa.

Burners, Enclosed Flame Gas.
Gehnrich, Hermann, New York.

Burners, Fuel Oil or Gas (See also Foundry Supplies).
Hawley Down Draft Furnace Co., Easton, Pa.
Metals Production Equipment Co., New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell, W. S., & Co., New York.

Burners, Powdered Coal.
Metals Production Equipment Co., New York.

Burnishing Barrels (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Parsons, W. B., Chicago, Ill.
Smith, Richardson Co., Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.

Burnishing Barrels, Leather Metal for.
Hanson & Van Winkle Co., Newark, N. J.

Burnishing Compounds and Chips (See also Platers' and Polishers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
International Chemical Co., Camden, N. J.

Cabbaging Presses.
General Briquetting Co., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Wood, R. D., & Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

Carboy Rockers.
Munning-Loeb Co., Matawan, N. J.

Case Hardening Materials.
Buchmann, C. G., Chemical Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.

Castings (See name of metal wanted).

Castings, Iron Machinery.
Bliss Co., E. W., Brooklyn, N. Y.
Metals Production Equipment Co., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Caustic Potash (See Platers', Polishers' and Galvanizers' Supplies).

Cement, Furnace.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Quigley Furnace Specialties Co., Inc., New York.

Centrifugal Dryers and Extractors.
Hanson & Van Winkle Co., Newark, N. J.
No-Dust Drying Machine Co., Providence, R. I.
Tolhurst Machine Works, Troy, N. Y.

Charcoal, Crude and Powdered (See also foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Chasing and Modeling.
Fogg, Arthur A., Meriden, Conn.
Kelch, G., New York.
Steinmeier, J. E., New York.

Chemicals (See Platers' Supplies).

Chemists.
Dover Laboratory, Dover, N. J.
Joseph, Irwin S., Rahway, N. J.
Ledoux & Co., New York.
Thompson & Morrison, Toronto, Ont.

Chromium (Pure) and Chromium Cupro.
Goldschmidt Thermit Co., New York.

Chucks, Spinning.
Bliss, E. W., Co., Brooklyn, N. Y.
Pryibil, P., Inc., New York.

Cinder Mills, Water (See also Foundry Supplies).
Moussette Co., O. J., Inc., Brooklyn, N. Y.
Obermayer, The S., Co., Chicago, Ill.
Standard Equipment Co., New Haven, Conn.
Whiting Foundry & Equipment Co., Harvey, Ill.

Cleaning Compounds for Metals (See also Platers' Supplies).
Anthony, H. M., & Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Buchanan, C. G., Chemical Co., Cincinnati, O.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Electric Smelt & Aluminum Co., Lockport, N. Y.
Ford, J. B., Co., Wyandotte, Mich.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Oakley Chemical Co., New York.
Rhodes, James H., & Co., New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Cock Grinders, Automatic.
Turner Machine Co., Philadelphia, Pa.

Coiling Machines (See also Rolling Mill Machinery).
Baird Machine Co., Bridgeport, Conn.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Torrington Manufacturing Co., Torrington, Conn.

Compositions, Buffing (See Buffing and Polishing Compositions).

Compressors, Centrifugal, Air and Gas.
General Electric Co., Schenectady, N. Y.

Consulting Platers (See Expert Instruction).

Copper Castings.
Ajax Metal Co., Philadelphia, Pa.
Lumen Bearing Co., Buffalo, N. Y.

Copper Cyanide.
Apothecaries Hall Co., Waterbury, Conn.
Roessler & Hasslacher Chemical Co., New York.
Wiarda, John C., & Co., Brooklyn, N. Y.

Copper, Electrolytic.
United Metals Selling Co., New York.
United States Smelting Co., Inc., New York.
Wenger, Paul, New York.

Copper Ingots.
Ajax Metal Co., Philadelphia, Pa.
Balbach Smelting & Refining Co., Newark, N. J.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Lang, R. F., New York.
Leavitt, C. W., & Co., New York.
Metals Trading Corporation, New York.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Seligman, Arthur, New York.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Taunton-New B'f'd Copper Co., New Bedford, Mass.
Trotter, Nathan, & Co., Philadelphia, Pa.
United Metals Selling Co., New York.
Wenger, Paul, New York.
White & Bro., Inc., Philadelphia, Pa.

Copper and Composition Nails, Tacks and Rivets.
Hassall, John, Inc., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Scovill Manufacturing Co., Waterbury, Conn.
Stimpson Edwin B., Co., Brooklyn, N. Y.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Copper Sheets, Wire, Rods, Bolts, Etc. (See Brass, Bronze and Copper Sheets, Etc.).

Copper Shot.
Handy & Harman, New York.
Riverside Metal Co., Riverside, N. J.
Seymour Manufacturing Co., Seymour, Conn.

Copper Tubes (See Brass and Copper Tubes).

Core Compound (See also Foundry Supplies)
Dixon, Jos., Crucible Co., Jersey City, N. J.
Obermayer, The S., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.

Core Machines (See Foundry Supplies).
Brown Specialty Machinery Co., Chicago, Ill.
Obermayer, The S., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip. Co., Akron, O.

Core Oil.
Paxson, J. W., Co., Philadelphia, Pa.

Core Ovens (See also Foundry Supplies).
Gehnrich Indirect Heat Oven Co., Brooklyn, N. Y.
Metals Production Equipment Co., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer, The S., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Steiner, E. E., Newark, N. J.
Wadsworth Core Machine & Equip. Co., Akron, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Tapering Machines.
Brown Specialty Machinery Co., Chicago, Ill.

Core Trays, Steel.
Paxson, J. W., Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip Co., Akron, O.

Countershafts, Ball Bearing.
Gardner Machine Co., Beloit, Wis.

Cranes.
Whiting Foundry Equipment Co., Harvey, Ill.

Crucibles, Stirrers, Stoppers, Nozzles, Etc. (See also Foundry Supplies).
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Niagara Falls (Ont.) G. & P. Co., 52 Church St., New York.
Obermayer, The S., Co., Chicago, Ill.
Seidel, R. B., Inc., Philadelphia, Pa.
Taylor, R. J., Inc., Philadelphia, Pa.

Crushers, Cinder (See also Foundry Supplies).
Moussette Co., O. J., Inc., Brooklyn, N. Y.
Paxson, J. W., Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.
Standard Equipment Co., New Haven, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Whiting Foundry Equipment Co., Harvey, Ill.

Cube Nickel.
Burns, E. Reed, Supply Co., Brooklyn, N. Y.
Wiarda, John C., & Co., Brooklyn, N. Y.

Cupels.
Dixon, Jos., Crucible Co., Jersey City, N. J.

Cupolas.
Obermayer, The S., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupro-Nickel.
Stamford Rolling Mills, Inc., New York.

Cyanide of Potassium (See Platers' Supplies).

Cyanide of Sodium (See Platers' Supplies).

Dental Golds and Solders.
Ney, The J. M., Co., Hartford, Conn.

Deoxidizers for Copper.
American Boron Products Co., Reading, Pa.
General Electric Co., Schenectady, N. Y.

Die-Casting Machinery.
Acme Die Casting Corp., Brooklyn, N. Y.
Doehler Die Casting Co., Brooklyn, N. Y.

Die Castings, Aluminum.
Doehler Die-Casting Co., Brooklyn, N. Y.
Maiwurm Aluminum Corporation, Pittsburgh, Pa.

Die Castings, Brass and Bronze.
Doehler Die Casting Co., Brooklyn, N. Y.
Sheldon, Wm. O. & E. R., New York.

Die Castings, White Metal.
Acme Die Casting Corp., Brooklyn, N. Y.
Doehler Die Casting Co., Brooklyn, N. Y.
Light Mfg. & Foundry Co., Pottstown, Pa.
Sheldon, Wm. O. & E. R., New York.

Dies, Sheet Metal Working.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Gem Mfg. Co., N. S., Pittsburgh, Pa.
Globe Machine & Stamping Co., Cleveland, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Dipping Baskets, Wire.
Driver-Harris Wire Co., Newark, N. J.
Jelliff, C. O., Mfg. Corp., Southport, Conn.
Paxson, J. W., Co., Philadelphia, Pa.
Smith, John P., & Co., New Haven, Conn.

Dipping Baskets, Stoneware.
Burns, E. Reed, Supply Co., Brooklyn, N. Y.
German-American Stoneware Works, New York.

Disc Polishing and Grinding Machines.
Gardner Machine Co., Beloit, Wis.

Dowel Pins (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Draw Benches—Wire, Rod and Tube.
Leiman Bros., New York.
Torrington Mfg. Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Drosses (See Metal Turnings, Drosses, Etc.).

Drop Hammers.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Drying-Out Machines.
Astle, H. J., & Co., Providence, R. I.
Baird Machine Co., Bridgeport, Conn.
No-Dust Drying Machine Co., Providence, R. I.
Smith, Richardson Co., Attleboro, Mass.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Tolhurst Machine Works, Troy, N. Y.
Torrington Mfg. Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Drying Ovens.
Gehnrich Indirect Heat Oven Co., Brooklyn, N. Y.
General Electric Co., Schenectady, N. Y.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.

Dust Arresters.
Brown Specialty Machinery Co,, Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Whiting Foundry & Equipment Co., Harvey, Ill.

Dust Collectors and Ventilating Systems.
Allington & Curtis Mfg. Co., Chicago, Ill.
Astle, H. J., & Co., Providence, R. I.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Drachsler, A. A., New York.
Kirk & Blum Co., Cincinnati, O.
Leiman Bros., New York.
Ohio Blower Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.

Dynamos, Platers' and Galvanizers' (See also Platers' Supplies).
Bennett-O'Connell Co., Chicago, Ill.
Bogue, Chas. J., Electric Co., New York.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
General Electric Co., Schenectady, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Jantz & Leist Co., Cincinnati, O.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.

Electric Cleaning Compounds (See Cleaning Compounds, Metal).

Electrogalvanizing Equipment (See Galvanizing Equipment).

Electroplating Equipment (See Platers', Polishers' and Galvanizing Equipment and Supplies).

Electroplating, Polishing, Coloring, Etc.
Hassall, John, Inc., Brooklyn, N. Y.
Krischer's Mfg. Co., New York.
Root, C. J., & Co., Bristol, Conn.
Sievering, Philip, New York.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Elevators.
Obermayer, The S., Co., Chicago, Ill.
Whiting Foundry Equipment Co., Harvey, Ill.

Emery.
Niagara Emery Mills, New York.

Emery Wheel Dressing Machine.
Divine Brothers Co., Utica, N. Y.

Enameling and Japanning Ovens.
Gehnrich Indirect Heat Oven Co., Brooklyn, N. Y.
General Electric Co., Schenectady, N. Y.
Monarch Engineering & Mgf. Co., Baltimore, Md.
Steiner, E., Newark, N. J.

Engineers, Foundry.
Paxson, J. W., Co., Philadelphia, Pa.
Quigley Furnace Specialties Co., Inc., New York.
Whiting Foundry Equipment, Harvey, Ill.

Engineers, Furnace.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Quigley Furnace Specialties Co., Inc., New York.
Rockwell, W. S., Co., New York.

Escutcheon Pins, All Metals.
Hassall, John, Brooklyn, N. Y.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Ethyl Acetate.
Franco-American Chemical Co., Carlstadt, N. J.

Exhaust Fans and Heads (See also Dust Collectors, Etc.).
Allington & Curtis Mfg. Co., Chicago, Ill.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Drachsler, A. A., New York.
General Electric Co., Schenectady, N. Y.
Kirk & Blum Co., Cincinnati, O.
Leiman Bros., New York.
Ohio Blower Co., Cleveland, O.

Exhaust Fans, Stoneware.
German-American Stoneware Works, New York.

Extractors, Centrifugal, Drying.
Tolhurst Machine Works, Troy, N. Y.

Eye Protectors.
Chicago Eye Shield Co., Chicago, Ill.

Felt Polishing Wheels.
Bacon Felt Co., Winchester, Mass.

Ferro Case.
Buchanan, C. G., Chemical Co., Cincinnati, O.

Fig Cleanser.
Burns, E. R., Supply Co., Brooklyn, N. Y.
International Chemical Co., Camden, N. Y.

Fillets, Leather (See Foundry Supplies and Equipment).

Fire Brick and Cement (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.
Quigley Furnace Specialties Co., Inc., New York.

Flasks, Brass Molders' (See also Foundry Supplies).
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer, The S., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Woodison, E. J., Co., Detroit, Mich.

Flint Shot.
U. S. Silica Co., Chicago, Ill.

Floor Plates (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Fluor Spar (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Fluxes for Metals.
American Boron Products Co,, Reading, Pa.
Basic Mineral Co., N. S., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
New Era Mfg. Co., Kalamazoo, Mich.
Obermayer, The S., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.

Fluxes, Soldering and Tinning.
Allen, L. B., Co., Inc., Chicago, Ill.
Buchanan, C. G., Chemical Co., Cincinnati, O.
Richards & Co., Boston, Mass.

Forgings, Automobile.
Bliss, E. W., Co., Brooklyn, N. Y.
Phosphor Bronze Smelting Co., Philadelphia, Pa.

Foundry Facings (See Foundry Supplies).

Foundry Pails.
Obermayer, The S., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.

Foundry Riddles (See Foundry Supplies and Equipment).

Foundry Supplies and Equipment (See also Foundry Facings, Furnaces, Etc.).
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Basic Mineral Co., N. S., Pittsburgh, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Blumenthal, H., & Co., New York.
Brown Specialty Machinery Co., Chicago, Ill.
Dings Magnetic Separator Co., Milwaukee, Wis.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Gem Mfg. Co., N. S., Pittsburgh, Pa.
Gautier, J. H., & Co., Jersey City, N. J.
Gehnrich Indirect Heat Oven Co., Brooklyn, N. Y.
Hawley Down Draft Furnace Co., Easton, Pa.
Herold Bros. Co., Cleveland, O.
Ideal Furnace Co., Chester, Pa.
Jelliff, C. O., Mfg. Corp., Southport, Conn.
Magnetic Manufacturing Co., Milwaukee, Wis.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Moussette Co., O. J., Inc., Brooklyn, N. Y.
Obermayer, The S., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Quigley Furnace Specialties Co., Inc., New York.
Rockwell, W. S., Co., New York.
Seidel, R. B., Inc., Philadelphia, Pa.
Standard Equipment Co., New Haven, Conn.
Steiner, E. E., Newark, N. J.
Taylor, R. J., Inc., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.
U. S. Silica Co., Chicago, Ill.
Wadsworth Core Machine & Equip. Co., Akron, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Woodison, E. J., Co., Detroit, Mich.

Furnace Insulation.
Armstrong Cork & Insulation Co., Pittsburg, Pa.

Furnace Specialties.
Quigley Furnace Specialties Co., Inc., New York.

Furnaces, Annealing, Brazing, Etc.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Metals Production Equipment Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Babbitt and Spelter.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.

Furnaces, Electric.
General Electric Co., Schenectady, N. Y.

Furnace Engineers (See Engineers, Furnaces).

Furnaces, Galvanizing and Tinning.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Metals Production Equipment Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Melting, for Oil, Coal, Coke or Gas (See also Foundry Supplies).
General Electric Co., Schenectady, N. Y.
Hawley Down Draft Furnace Co., Easton, Pa.
Ideal Furnace Co., Chester, Pa.
Metals Production Equipment Co., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer, The S., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell, W. S., Co., New York.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Powdered Coal Burning.
Metals Production Equipment Co., New York.

Furnaces, Reverberatory.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell, W. S., Co., New York.

Galvanized Specialties, Nails, Screws, Etc.
Hassall, John, Inc., Brooklyn, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Galvanizing Equipment.
Bennett-O'Connell Co., Chicago, Ill.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing for the Trade.
Hassall, John, Inc., Brooklyn, N. Y.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Gas Producers and Power Plants.
Wood, R. D., & Co., Philadelphia, Pa.

Generators and Motors (See also Dynamos, Etc.).
General Electric Co., Schenectady, N. Y.

German Silver Ingots, Castings, Sheets, Wire Rods, Tubes.
American Brass Co., Waterbury, Conn.
American Brass Forging Co., Inc., New York.
Bridgeport Brass Co., Bridgeport, Conn.
Dueber Watch Case Mfg. Co., Canton, O.
Pilling Brass Co., Waterbury, Conn.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Stamford Rolling Mills, Inc., New York.
Trumpbour-Whitehead Co., New York.

Gold Alloys.
Handy & Harman, New York.
Ney, The J. M., Company, Hartford, Conn.
Riverside Metal Co., Riverside, N. J.

Gold Anodes (See Anodes, Gold).

Gold, Chloride of.
Cooper, Charles, & Co., New York.

Gold Foil.
Ney, The J. M., Company, Hartford, Conn.

Gold, Ingots, Bars, Plates, Etc.
Handy & Harman, New York.
Ney, The J. M., Company, Hartford, Conn.
Riverside Metal Co., Riverside, N. J.

Gold and Silver Refiners.
Handy & Harman, New York.
Jackson, John J., Co., Newark, N. J.
Ney, The J. M., Company, Hartford, Conn.
Roessler & Hasslacher Chemical Co., New York.
Riverside Metal Co., Riverside, N. J.
Stein, William A., Newark, N. J.

Gold Solders.
Ney, The J. M., Company, Hartford, Conn.

Gold Trysalyt.
Roessler & Hasslacher Chemical Co., New York.

Grinding Machinery.
Bennett-O'Connell Co., Chicago, Ill.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Divine Brothers Co., Utica, N. Y.
Gardner Machine Co., Beloit, Wis.
Gem Mfg. Co., N. S., Pittsburgh, Pa.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Hardness Testing Instruments.
Holz, Herman A., New York.
Shore Instrument Co., New York.

Hoists, Electric, Pneumatic, Hand.
Whiting Foundry Equipment Co., Harvey, Ill.

Hydraulic Accumulators.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Hydraulic Machinery, Presses, Jacks, Etc.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Hytempite Furnace Cement.
Quigley Furnace Specialties Co., Inc., New York.

Insulating Brick.
Armstrong Cork & Insulation Co., Pittsburg, Pa.

Japanning for the Trade.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Japanning Ovens (See Enameling and Japanning Ovens).

Japans.
Apothecaries Hall Co., Waterbury, Conn.

Jewelers' Bars.
Dueber Watch Case Mfg. Co., Canton, O.

Jewelers' Equipment and Supplies (See also Supplies).
Astle, H. J., & Co., Providence, R. I.
Leiman Bros., New York.
No-Dust Drying Machine Co., Providence, R. I.
Smith, Richardson Co., Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.

Jewelers' Gold, Platinum and Silver Solders.
Ney, The J. M., Company, Hartford, Conn.

Jewelers' Findings.
Smith, Richardson Co., Attleboro, Mass.

Kalye.
Anthony Co., H. M., New York.

Lacquering Ovens. (See Enameling Ovens).

Lacquer Sprayers.
De Vilbiss Mfg. Co., Toledo, O.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Eureka Pneumatic Spray Co., New York.
Paasche Air Brush Co., Chicago, Ill.

Lacquers and Enamels (See also Platers' Supplies).
Barrett, M. L., & Co., Chicago, Ill.
Celluloid Zapon Co., New York.
Cooper, Charles, & Co., New York.
Dupont Chemical Works, New York.
Egyptian Lacquer Manufacturing Co., New York.
Eureka Pneumatic Spray Co., New York.
General Bakelite Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch, Franklin H., Co., New York.

Ladle Heaters and Dryers (See Foundry Supplies).

Lathes, Brass Finishers'.
Bliss, E. W., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

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Lathes, Spinning.
Pryibil, P., Inc., New York.

Lead, Antimonial.
Ajax Metal Co., Philadelphia, Pa.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., Inc., New York.

Lead Burning.
Chadwick-Boston Lead Co., Boston, Mass.
Klinge, Wm. E., Jr., Brooklyn, N. Y.
Wiarda, John C., & Co., Brooklyn, N. Y.

Lead Came.
Union Smelting & Refining Co., Inc., New York.

Lead Castings, Antimonial.
Ajax Metal Co., Philadelphia, Pa.
North American Smelting Co., Philadelphia, Pa.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., Inc., New York.

Leaden Ware, Lead Tanks, Etc.
Chadwick-Boston Lead Co., Boston, Mass.
Klinge, Wm. E., Jr., Brooklyn, N. Y.
Wiarda & Co., John C., Brooklyn, N. Y.

Lead, Pig and Bar.
Birkenstein, S., & Sons, Chicago, Ill.
Chadwick-Boston Lead Co., Boston, Mass.
Coates, Bennett & Reidenbach, Inc., Rochester, N. Y.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Seligman, Arthur, New York.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Sheldon, Wm. O., & E. R., New York.
Trotter, Nathan, & Co., Philadelphia, Pa.
Union Smelting & Refining Co., Inc., New York.
United Metal Selling Co., New York.
U. S. Reduction Co., Chicago, Ill.
United States Smelting Co., Inc., New York.
Wenger, Paul, New York.

Lead Pipe.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Union Smelting & Refining Co., Inc., New York.

Lead Strips and Moldings.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., Inc., New York.

Lead Wire.
Union Smelting & Refining Co., Inc., New York.

Leather Meal for Dry Tumbling (See also Platers' Supplies).
Bennett-O'Connell Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.

Lubricants, Graphite.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

Machine Shop Specialties.
Newman Mfg. Co., Cincinnati, O.

Magnesium Metal.
Cooper, Charles, & Co., New York.
Goldschmidt Thermit Co., New York.
Leavitt, C. W., & Co., New York.
Roessler & Hasslacher Chemical Co., New York.

Magnetic Metal Separators (See also Foundry Supplies).
Dings Magnetic Separator Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Magnetic Manufacturing Co., Milwaukee, Wis.
Paxson, J. W., Co., Philadelphia, Pa.

Manganese Bronze (See Bronze and Composition Ingots and Castings).

Manganese, 98-99 Per Cent.
Goldschmidt Thermit Co., New York.

Manganese Aluminum (10-90 per cent).
Goldschmidt Thermit Co., New York.

Manganese Bronze Sheets, Rods, Etc.
Bridgeport Brass Co., Bridgeport, Conn.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Manganese Copper.
Ajax Metal Co., Philadelphia, Pa.
Electric Smelting & Alum. Co., Lockport, N. Y.
Goldschmidt Thermit Co., New York.
Lang, R. F., New York.
Leavitt, C. W., & Co., New York.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Manganese Metal.
Cooper, Charles, & Co., New York.
Goldschmidt Thermit Co., New York.
Leavitt, C. W., & Co., New York.
Roessler & Hasslacher Chemical Co., New York.

Match Plates.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Turner Machine Co., Philadelphia, Pa.

Metallurgists, Consulting.
Dover Laboratory, Dover, N. J.
Joseph, Irwin S., Rahway, N. J.
Ledoux & Co., New York.

Metals (See name of metal wanted).

Metals, Dealers in All Kinds of New (See also name of metal wanted).
Ajax Metal Co., Philadelphia, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Metal Export Co. of America, New York.
Richards & Co., Boston, Mass.
Seligman, Arthur, New York.
Trotter, Nathan, & Co., Philadelphia, Pa.
Wenger, Paul, New York.

Metals, Dealers in Old.
Birkenstein, S., & Sons, Chicago, Ill.
Capper Pass & Son, Ltd., Bristol, England.
Coates, Bennett & Reidenbach, Inc., Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Metal Export Co. of America, New York.
Moers, E. M., Sons, New York.
North American Smelting Co., Philadelphia, Pa.
Radnal, Josef, New York.
Riverside Metal Co., Riverside, N. J.
United Smelt. & Aluminum Co., New Haven, Conn.

Metals, Dealers in Old—Gold, Silver, Platinum.
Handy & Harman, New York.
Ney, The J. M., Company, Hartford, Conn.
Riverside Metal Co., Riverside, N. J.

Metal Goods Made to Order.
American Brass Co., Waterbury, Conn.
American Brass Forging Co., Inc., New York.
Apollo Metal Works, La Salle, Ill.
Baird Machine Co., Bridgeport, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Brown Bag Filling Machine Co., Fitchburg, Mass.
Gem Mfg. Co., N. S., Pittsburgh, Pa.
Krischer's Mfg. Co., New York.
Lober Art Brass & Specialty Co., Toledo, O.
Manhattan Brass Co., New York.
Ornamental Casting Co., New York.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Metals, Plated Sheet.
American Nickeloid Co., Peru, Ill.
Apollo Metal Works, La Salle, Ill.
Benson, H. K. & F. S., Glen Ridge, N. J.
National Sheet Metal Co., Peru, Ill.

Metal, Silver Plated Sheet.
Benson, H. K. & F. S., Glen Ridge, N. J.

Metal Refiners—White Metal.
Capper, Pass & Son, Ltd., Bristol, England.

Metals (Carbon Free).
Goldschmidt Thermit Co., New York.

Metal Spraying Machines.
Metals Coating Co. of America, Chicago, Ill.

Metal Turnings, Drosses, Residues, Etc., Buyers of.
Ajax Metal Co., Philadelphia, Pa.
Balbach Smelting & Refinery Co., Newark, N. J.
Birkenstein, S., & Sons, Chicago, Ill.
Capper, Pass & Son, Ltd., Bristol, England.
Illinois Smelting & Refining Co., Chicago, Ill.
Metal Export Co. of America, New York.
Moers, E. M., Sons, New York.
North American Smelting Co., Philadelphia, Pa.
Radnal, Josef, New York.
Toothill Rolling Mills, Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., Inc., New York.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Meters, Flow, Air, Gas and Water.
General Electric Co., Schenectady, N. Y.

Mineral Cleaner.
Apothecaries Hall Co., Waterbury, Conn.
Electric Smelting & Alum'n Co., Lockport, N. J.

Mixers for Gold and Silver Sweepings.
Moussette Co., O. J., Inc., Brooklyn, N. Y.

Modeling and Chasing (See Chasing and Modeling).

Mold Dryers, Portable (See also Foundry Supplies).
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., & Co., Philadelphia, Pa.

Mold Wash, Silica (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Molder's Tubs (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Molds, Ingot (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Molds, Water-Cooled, for Babbitt, Etc.
Schweizer, Chas. K., Co., St. Louis, Mo.

Molding Machines (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.

Molding Sand (See Sand).

Monel Metal.
International Nickel Co., New York.

Mouldmakers.
Fogg, Arthur A., Meriden, Conn.
Kelch, G., New York.
Steinmeier, J. E., New York.

Muffles, Graphite.
Dixon, Jos., Crucible Co., Jersey City, N. J.

Muntz's Metal—Sheets, Rods, Bolts, Nails, Etc.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Nails, All Metals.
Hassall, John, Brooklyn, N. Y.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Nichrome Dipping Baskets.
Driver-Harris Wire Co., Harrison, N. J.

Nickel, Nickel Castings, Shot Nickel.
Bennett-O'Connell Co., Chicago, Ill.
Burns, E. R., Supply Co., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Hendricks Bros., New York.
International Nickel Co., New York.
Leavitt, C. W., & Co., New York.
Munning-Loeb Co., Matawan, N. J.
Richards & Co., Boston, Mass.
Seligman, Arthur, New York.
Seymour Mfg. Co., Seymour, Conn.
Trotter, Nathan & Co., Philadelphia, Pa.
Wiarda & Co., John C., Brooklyn, N. Y.

Nickel-Bronze Castings and Ingots.
Ajax Metal Co., Philadelphia, Pa.
American Brass Forging Co., Inc., New York.
Damascus Bronze Co., Pittsburg, Pa.

Nickel Plating (See Electroplating).

Nickel Salts (See Platers' Supplies).

Nickel Sheets.
Seymour Manufacturing Co., Seymour, Conn.

Nickel Silver Tubes.
Wells, A. H., & Co., Waterbury, Conn.

Oil Pumps and Storage Tanks.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Metals Production Equipment Co., New York.
Rockwell Co., W. S., New York.

Oils, Core (See also Foundry Supplies.)
Paxson, J. W., Co., Philadelphia, Pa.

Oils, Tempering and Lubricating.
Apothecaries Hall Co., Waterbury, Conn.

Oven Insulation.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Ovens (See Baking, Enameling and Sherardizing Ovens. Also Foundry Supplies).

Overhead Trolleys and Tracks.
Whiting Foundry Equipment Co., Harvey, Ill.

Pan Grinders and Mixers.
Paxson, J. W., Co., Philadelphia, Pa.

Parting Compounds (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Pattern Metal.
Ajax Metal Co., Philadelphia, Pa.
North American Smelting Co., Philadelphia, Pa.

Pattern Letters and Figures.
Paxson, J. W., Co., Philadelphia, Pa.

Patterns, Metal.
Griffoul, A., & Bros. Co., Newark, N. J.
Turner Machine Co., Philadelphia, Pa.

Perforated Metals.
Prisk, Wm. M., & Sons, Mfg. Co., Yalesville, Conn.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Pewter.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Phosphor Bronze Ingots, Castings, Etc.
Ajax Metal Co., Philadelphia, Pa.
Damascus Bronze Co., Pittsburgh, Pa.
Illinois Smelting & Refining Co., Chicago, Ill.
Lang, R. F., New York.
Lumen Bearing Co., Buffalo, N. Y.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seligman, Arthur, New York.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Bronze Sheets, Wire Rods, Etc.
Bridgeport Brass Co., Bridgeport, Conn.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Pilling Brass Co., Waterbury, Conn.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.
Trumpbour Whitehead Co., New York.

Phosphor Copper and Phosphor Tin.
Ajax Metal Co., Philadelphia, Pa.
Coates, Bennett & Reidenbach, Inc., Rochester, N. Y.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Goldschmidt Thermit Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
New Era Mfg. Co, Kalamazoo, Mich
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.
Seligman, Arthur, New York.

Phosphorizers (See Crucibles, Etc.).

Phosphorus (See also Foundry Supplies).
General Chemical Co., Philadelphia, Pa.
Paxson, J. W., Co., Philadelphia, Pa.

Pickling Compounds.
Hanson & Van Winkle Co., Newark, N. J.

Pickling Machines, Automatic.
Torrington Manufacturing Co., Torrington, Conn.

Pipe Covering.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Plastic Bronze.
Ajax Metal Co., Philadelphia, Pa.
American Boron Products Co., Reading, Pa.

Plated Sheet Metal (See Metals, Plated Sheet).

Platers' Metal (See also Platers' Supplies).
Kemp, W. H., Co., New York.
Pilling Brass Co., Waterbury, Conn.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Platers', Polishers' and Galvanizers' Equipment and Supplies.
Abbott Ball Co., Hartford, Conn.
Allington & Curtis Mfg. Co., Chicago, Ill.
Ames Sword Co., Chicopee, Mass.
Anthony, H. M., Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Astle, H. J., & Co., Providence, R. I.
Automatic Buffing Machine Co., Buffalo, N. Y.
Bacon Felt Co., Winchester, Mass.
Baird Machine Co., Bridgeport, Conn.
Barrett, M. L., & Co., Chicago, Ill.
Bennett-O'Connell Co., Chicago, Ill.
Blumenthal, H., & Co., New York.
Bogue, Chas. J., Electric Co., New York.
Buchanan, C. G., Chemical Co., Cincinnati, O.
Burns, E. Reed, Supply Co., Brooklyn, N. Y.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Cleveland Tool & Supply Co., Cleveland, O.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Cooper, Charles, & Co., New York.
Corcoran, A. J., Inc., New York.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Brothers Co., Utica, N. Y.
Drachsler, A. A., New York
Driver-Harris Wire Co., Harrison, N. J.
Eager Electric Co., Watertown, N. Y.
Ely, C. Upham, New York.
Ford, J. B., Co., Wyandotte, Mich.
Franco-American Chemical Co., Carlstadt, N. J.
Gardner Machine Co., Beloit, Wis.
Gem Mfg. Co., N. S., Pittsburgh, Pa.
General Chemical Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Globe Machine & Stamping Co., Cleveland O.
Hanson & Van Winkle Co., Newark, N. J.
Hegeler Zinc Co., Danville, Ill.
Herold Bros. Co., Cleveland, O.
International Chemical Co., Camden, N. J.
Jackson, John J., & Co., Newark, N. J.
Jantz & Leist Co., Cincinnati, O.
Jelliff, C. O., Mfg. Corp., Southport, Conn.
Kalbfleisch, Franklin H., New York.
Kirk & Blum Co., Cincinnati, O.
Lang, R. F., New York.
Leiman Bros., New York.
L'Hommedieu, Chas. F. & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
No-Dust Drying Machine Co., Providence, R. I.
Oakley Chemical Co., New York.
Ohio Blower Co., Cleveland, O.
Parsons, W. R., Chicago, Ill.
Rhodes, Jas. H., & Co., New York.
Robinson Automatic Machine Co., Detroit, Mich.
Roessler & Hasslacher Chemical Co., New York.
Smith, John P., & Co., New Haven, Conn.
Smith, Richardson, Co., Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
U. S. Smelting Co., Inc., New York.
Wiarda Co., John C., Brooklyn, N. Y.
Woodison, E. J., Co., Detroit, Mich.

Plating, Job (See Electroplating, Polishing, etc.).

Platinum.
Handy & Harman, New York.
Roessler & Hasslacher Chemical Co., New York.
Stein, William A., Newark, N. J.
United States Smelting Co., Inc., New York.

Platinum, Sheet, Wire, Solder.
Handy & Harman, New York.
Ney, The J. M., Company, Hartford, Conn.
Roessler & Hasslacher Chemical Co., New York.

Platinum Scrap, Buyers of.
Handy & Harman, New York.
Ney, The J. M., Company, Hartford, Conn.
Radnai, Josef, New York.
Roessler & Hasslacher Chemical Co., New York.
Stein, William A., Newark, N. J.

Platinum Solder.
Ney, The J. M., Company, Hartford, Conn.

Plumbago (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Polishing and Buffing (See also Electroplating, Etc.).
Prisk, Wm. M., & Sons Mfg. Co., Yalesville, Conn.
Sievering, Philip, New York.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Polishing and Grinding Engineers.
Divine Brothers Co., Utica, N. Y.

Polishing, Buffing and Burnishing Machinery and Supplies (See Platers' Supplies).

Polishing, Belts, Endless (See also Platers' Supplies).
Ames Sword Co., Chicopee, Mass.
Bennett-O'Connell Co., Chicago, Ill.
Divine Brothers Co., Utica, N. Y.
Munning-Loeb Co., Matawan, N. J.

Potash (See Platers' Supplies).

Presses, Bench and Foot.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Leiman Bros., New York
Shuster, The F. B., Co., New Haven, Conn.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Cabbaging.
Paxson, J. W., Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Presses, Coining.
Bliss, E. W., Co., Brooklyn, N. Y.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Drop.
Bliss, E. W., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Power.
Baird Machine Co., Bridgeport, Conn.
Watson-Stillman Co., New York.
Bliss, E. W., Co., Brooklyn, N. Y.
Garrison, A., Foundry Co., Pittsburg, Pa.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Pressure Blowers (See also Foundry Supplies).
Astle, H. J., & Co., Providence, R. I.
Drachsler, A. A., New York.
Eclipse Air Brush & Compressor Co., Newark, N. J.
Eureka Pneumatic Spray Co., New York.
General Electric Co., Schenectady, N. Y.
Leiman Bros., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
New Haven Sand Blast Co., New Haven, Conn.
Paxson, J. W., Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Pumice.
Baird Machine Co., Bridgeport, Conn.
Paxson, J. W., Co., Philadelphia, Pa.
Rhodes, Jas. H., & Co., Chicago, Ill.

Pyroscopes.
Shore Instrument Co., New York.

Pyrometers.
Holz, Herman A., New York.
Taylor Instrument Companies, Rochester, N. Y.

Pyrometer Shields
Dixon, Jos., Crucible Co., Jersey City, N. J.

Refiners, Metal (See Smelters and Refiners).

Retorts, Graphite.
Dixon, Jos., Crucible Co., Jersey City, N. J.

Rheostats (See Platers' Supplies).

Riveting Machines.
Shuster, The F. B., Co., New Haven, Conn.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Wood, R. D., & Co., Philadelphia, Pa.

Rivets—Brass, Aluminum, Etc.
Hassall, John, Inc., New York.
Hendricks Bros., New York.
Kemp, W. H., Co., New York.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

Roll-Grinding Machines.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Chilled and Sand.
Garrison, A., Fdy. & Machine Co., Pittsburgh, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Jewelers'.
Leiman Bros., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolling Mill Machinery.
Garrison, A., Fdy. & Machine Co., Pittsburgh, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Sand, Fire (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Sand for Blasting.
Paxson, J. W., Co., Philadelphia, Pa.
U. S. Silica Co., Chicago, Ill.

Sand Blast Tumbling Barrels, Machinery and Equipment.
Astle, H. J., & Co., Providence, R. I.
Brown Specialty Machinery Co., Chicago, Ill.
Leiman Bros., New York.
Mott Sand Blast Mfg. Co., New York.
New Haven Sand Blast Co., New Haven, Conn.
Paxson, J. W., Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.
Standard Equipment Co., New Haven, Conn.
Whiting Foundry & Equipment Co., Harvey, Ill.

Sand Dryers (See Foundry Supplies).

Sand Sifters and Mixers.
Brown Specialty Machinery Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip. Co., Akron, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Sand, Molding (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Sawdust, Boxwood, for Drying Purposes (See also Platers' Supplies).
Bennett-O'Connell Co., Chicago, Ill.
Burns, E. R. Supply Co., Brooklyn, N. Y
Hanson & Van Winkle Co. Newark, N. J.
L'Hommedieu, Chas., F., & Sons Co., Chicago, Ill.
Sommers, John, Faucet Co., Newark, N. J.
Wiarda, John C., & Co., Brooklyn, N. Y.

Sawdust Drying-Out Boxes (See also Platers' Supplies).
Astle, H. J., & Co., Providence, R. I.
Bennett-O'Connell Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
No-Dust Drying Machine Co., Providence, R. I.
Smith, Richardson Co., Attleboro, Mass.
Steiner, E. E., Newark, N. J.

Schoop Metal Spraying Process.
Metals Coating Co. of America, Chicago, Ill.

Scleroscope.
Shore Instrument Co., New York.

Scrap Metals (See Metal Turnings, Dresses, Residues, Etc.).

Screw Machine Products.
Brown Bag Filling Machine Co., Fitchburg, Mass.

Separators, Magnetic (See Magnetic Metal Separators).

Separators, Oil and Steam.
Ohio Blower Co., Cleveland, O.

Shanks, Ladles and Crucible.
Paxson, J. W., Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Shears, Power.
Bliss, E. W., Co., Brooklyn, N. Y.
Garrison, A., Fdy. & Machine Co., Pittsburgh, Pa.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Sheet Metal Straightening, Cutting and Forming Machinery.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Shuster, The F. B., Co., New Haven, Conn.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Sheets, White Metal.
Union Smelting & Refining Co., New York.

Sherardizing (See also Galvanizing).
Globe Machine & Stamping Co., Cleveland, O.

Sherardizing Ovens.
Gehnrich, Herman, New York.
General Electric Co., Schenectady, N. Y.
Globe Machine & Stamping Co., Cleveland, O.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Shop Furniture, Etc.
Sly, W. W., Mfg. Co., Cleveland, O.

Silica Sand.
U. S. Silica Co., Chicago, Ill.

Silica, Pulverized.
Paxson, J. W., Co., Philadelphia, Pa.
U. S. Silica Co., Chicago, Ill.

Shop Pans.
Paxson, J. W., Co., Philadelphia, Pa.

Silicon.
Leavitt, C. W., & Co., New York.

Silicon Copper.
Ajax Metal Co., Philadelphia, Pa.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelting & Alum'n Co. Lockport, N. Y.
Goldschmidt Thermit Co., New York.
Lang, R. F., New York.
Roessler & Hasslacher Chemical Co., New York.

Silver and Gold Granulated.
Handy & Harman, New York.
Jackson, John J., & Co., Newark, N. J.
Ney, The J. M., Company, Hartford, Conn.

Silver Cyanide.
Apothecaries Hall Co., Waterbury, Conn.
Roessler & Hasslacher Chemical Co., New York.

Silver, Nitrate and Chloride of (See also Platers' Supplies).
Buchanan, C. G., Chemical Co., Cincinnati, O.
Handy & Harman, New York.
Jackson, John J., & Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.

Silver Ingots, Bars, Plates, Etc.
Handy & Harman, New York.
Jackson, John J., & Co., Newark, N. J.
Ney, The J. M., Company, Hartford, Conn.

Silver Refiners.
Handy & Harman, New York.
Jackson, John J., & Co., Newark, N. J.
Ney, The J. M., Company, Hartford, Conn.
Roessler & Hasslacher Chemical Co., New York.
Stein, William A., Newark, N. J.

Silver, Rolled Sterling.
Handy & Harman, New York.
Jackson, John J., & Co., Newark, N. J.
Ney, The J. M., Company, Hartford, Conn.
Riverside Metal Co., Riverside, N. J.

Silver Solder.
Ney, The J. M., Company, Hartford, Conn.

Silver Trysalyt.
Roessler & Hasslacher Chemical Co., New York.

Silver Wire.
Handy & Harman, New York.
Jackson, John J., & Co., Newark, N. J.
Ney, The J. M., Company, Hartford, Conn.

Slitting Machines.
Stimpson, Edwin B., Co., Brooklyn, N. Y.
Torrington Manufacturing Co., Torrington, Conn.

Smelters of Copper-Bearing Materials.
Ajax Metal Co., Philadelphia, Pa.
Balbach Smelting & Refining Co., Newark, N. J.
Capper Pass & Son, Ltd., Bristol, England.
North American Smelting Co., Philadelphia, Pa.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Philadelphia, Pa.

Smelters and Refiners, Gold and Silver.
Handy & Harman, New York.
Ney, The J. M., Company, Hartford, Conn.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.
Stein, William A., Newark, N. J.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Smelters and Refiners—White Metal.
Ajax Metal Co., Philadelphia, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Capper, Pass, & Son, Ltd., Bristol, England.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Soap (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
International Chemical Co., Camden, N. J.
Munning-Loeb Co., Matawan, N. J.
Wiarda, John C., & Co., Brooklyn, N. Y.

Solder, Aluminum.
Allen, L. B., Co., Inc., Chicago, Ill.
Aluminum Company of America, Pittsburgh, Pa.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Kemp, W. H., Co., New York.
Lang, R. F., New York.
Richards & Co., Boston, Mass.
United Smelt. & Alum'n Co., New Haven, Conn.
U. S. Reduction Co., Chicago, Ill.

Solder Bar.
Union Smelting & Refining Co., Inc., New York.

Solder, Brazing.
Ajax Metal Co., Philadelphia, Pa.
Allen, L. B., Co., Inc., Chicago, Ill.
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EVERY manufacturer comes to an appreciation of the importance of knowing where he can get raw material of dependable quality.

To the founder there can be no better tidings than the positive knowledge the high standard of E. S. & A. metals will in no wise be sacrificed because of high operating costs.

THE ELECTRIC SMELTING AND ALUMINUM CO. LOCKPORT N.Y.

"INGOTS WITH A REPUTATION"
CONTINUE TO LEAD IN
DEPENDABILITY

Pure Aluminum Ingot
Nickel Aluminum
No. 15 Aluminum Alloy
Aluminum Bronze
Aluminum Solder
Silicon Copper
Manganese Copper
Manganese Bronze
Ferro Aluminum
Phosphor Tin 5%
Phosphor Copper 15%
Silver Bronze
ESCO Babbitt Metal
LOCKPORT 55 Babbitt
Genuine Babbitt Metal
All Grades of Solder
Spelter
Stick Phosphorus

Try them—you'll see

RICO PRODUCTS

DON'T THINK

because you find some brands of

RICO PRODUCTS

WESTERN SPELTER

unsatisfactory, that every brand

IS BAD

We make it our business to test each of the many grades we handle, which relieves you of risk on any order with which you may favor us. We also sell remelted spelter and

"EVERY METAL THE BRASS FOUNDER NEEDS."

RICHARDS & COMPANY, Inc.

ESTABLISHED 1812

200-206 CAUSEWAY STREET
117-125 BEVERLY STREET . . . . BOSTON

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No Need To Worry About Real Potash

International Metal Cleaner

No. 121

is being widely used in place of Real Potash by a large number of manufacturers who are cleaning the most difficult kinds of work, with satisfactory results.

Let our Expert advise you No charge for his services

International Chemical Co.

Camden, N. J.

Chemicals for the cleaning of Metal Work our specialty